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JAN 29 1938

Engineering NEWS-RECORD

January 27, 1938

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VOL. 120 *JANUARY 27, 1938* No. 4

THIS WEEK AND NEXT

RECREATION has long been provided for the people within driving distance of the Englewood Dam reservoir in the Miami Conservancy District of Ohio. With the building of a new low dam in the reservoir's upper reaches, new ponds, formerly existing only at high river stage, add to these recreational facilities.

Army Engineers on the Pacific Coast in Oregon plan an ingenious type of jetty head construction featuring rock wall protection for heavy concrete block-pouring operations.

When overloaded sewers in the Aberjona River valley (Mass.) relieved themselves by overflowing through manhotes, it required the expenditure of $2,600,000 to correct the situation. Pre-cast concrete pipe was adapted to some interesting uses, including the construction of tunnel arches with half section of pipe.

Two Engineering News-Record *staff men have brought material from the Road Show and convention in Cleveland last week. The first report covers proceedings at the convention and the second, covering 9 pages of this issue, tells what's new in more than two hundred equipment lines displayed at the show.*

Rigid frames in concrete are being extended into the field of longer spans by two expedients—cantilever side spans as counterweights (Columbus, Neb.) and hollow ribs (Schmitz Park, Seattle). A cantilever-side-span design was also completed this year in Hawaii, and its 125 ft. main span is 16 ft. longer than the Columbus bridge. It contains a number of interesting features and details and is described in this issue.

MEETING REQUIREMENTS to provide an unobstructed floor in an arena always provides challenging problems for engineers. Next week a notable example of such a structure will be described.

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THE COVER PICTURE shows steel work in progress on "The Spire of the Sun" at the Golden Gate International Exposition at San Francisco. This structure will be 400 ft. high, supported on piles driven in the new fill. *Roberts and Roberts Photo*

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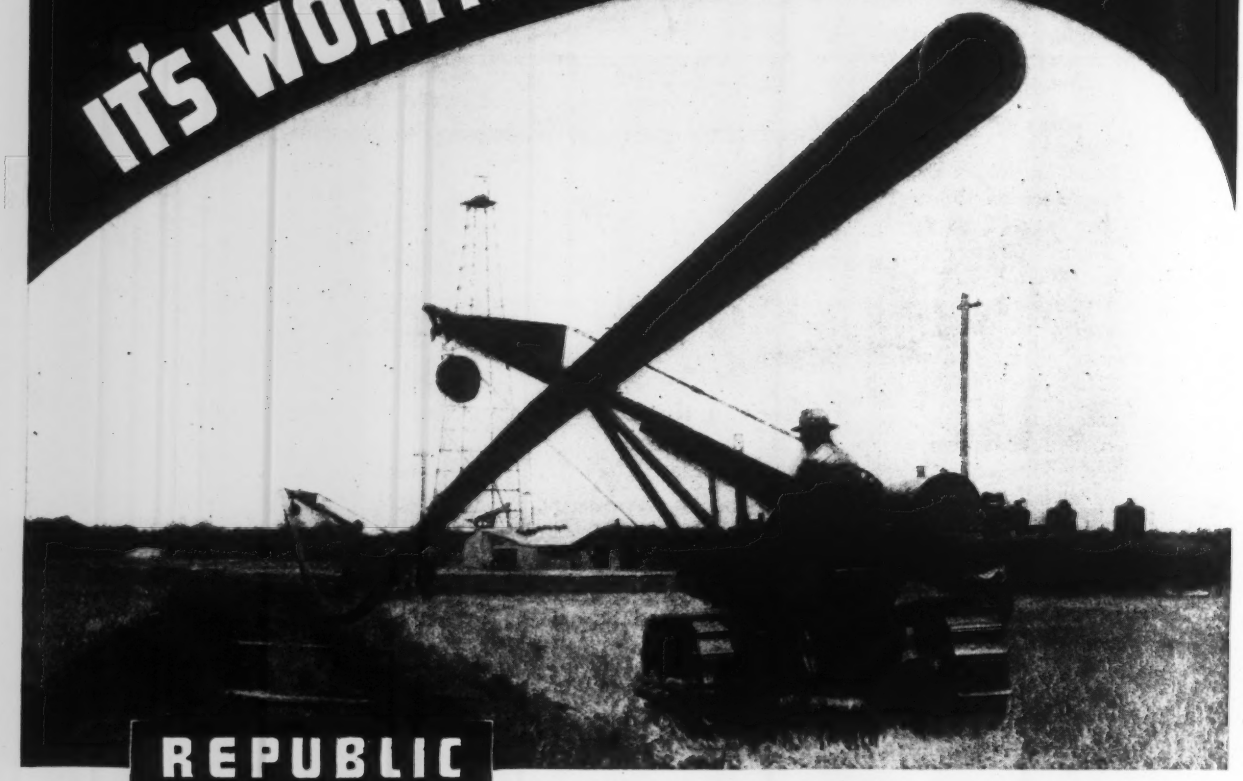
IT'S WORTH LOOKING INTO



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THE WEEK'S EVENTS

TVA Constitutionality Upheld by Court

District court holds authority's acts conform with a constitutional statute

The act creating the Tennessee Valley Authority is within the powers of Congress, and the procedure of the authority in generating and selling power wholly conforms with the provisions of the act. A three-judge federal court sitting in Chattanooga so held on Jan. 21 in denying an injunction against the authority's actions which had been sought by nineteen power companies in the Tennessee Valley area. The court threw out all the contentions of the power companies.

Coercion and combination

The power companies contended that TVA had conspired with PWA to compel the companies' customers to purchase TVA power. On this contention, the court held that no evidence of conspiracy had been introduced, that PWA loans to municipalities to build power systems were entirely legal, and that the decision to purchase TVA power rested at all times with the customers.

It was admitted that the companies would in the future suffer substantial damages through the loss of possible customers, but these damages, the court held, do not constitute legal injury. The customers were lost by the natural attraction of lower rates.

State rights

The court rejected contentions of the power companies that TVA, by selling power at rates lower than those fixed by state regulatory commissions, interfered with the rights and powers of the states. It pointed out that all of the states in the area affected have authorized municipalities and cooperatives to purchase TVA power, either by specific laws or by general laws permitting municipal and cooperative sale of power. "It is a strange doctrine," the court said, "that acts authorized by a sovereign state constitute interference with its sovereign rights because of the fact that they are also authorized by the federal government." It was further pointed out that no state had intervened in the action in behalf of the power companies.

There remain, the court held, only two questions to be decided: has the authority exceeded its statutory powers in generating and selling electricity; and is the statute constitutional?

Power versus flood control

Section 9-A of the Tennessee Valley Authority Act of 1933 directs the board "in the operation of any dam or reservoir in its possession and control to regulate the stream flow primarily for the purposes of promoting navigation and controlling floods. So far as may be consistent with such purposes, the board is authorized to provide and operate the facilities for the generation of electrical energy, . . . to transmit and market such

(*Continued on page 131*)

• • •

Cut in Chicago Diversion Opposed in Congress

Hearings on a bill to continue the diversion from Lake Michigan of 5,000 second-ft. of water through the Lakes-to-Gulf Waterway have been started by the House Committee on Rivers and Harbors. Proponents of the bill argue that the Supreme Court, in limiting diversion to 1,500 sec.-ft. after next January, took account only of sanitary considerations and overlooked the requirements of navigation through the $120,000,000 canal connecting Chicago with the Mississippi River. The city's expenditure of $250,000,000 on sewage disposal plants, it is contended, has cleared up the unsanitary condition that was the basis for the previous litigation.

The new locks and dams on the Illinois waterway, which will be completed by the end of the year, have been designed to insure a stabilized 9-ft. channel with the reduced amount of diversion, the Chief of Engineers said recently, speaking before the National Rivers and Harbors Congress. The effect of the change upon the Mississippi River between the mouth of the Illinois and Cairo, however, is still under study.

Mortgage Insurance Agreed On

House adopts conference version of bill to stimulate residential building construction

A revised text of the administration-sponsored bill to stimulate private housing construction under the Federal Housing Administration was adopted Jan. 20 by a conference committee and was passed Jan. 21 by the House. The new version dropped the Lodge amendment requiring that prevailing wage standards be maintained on all insured projects.

The bill amends the Federal Housing Act to reduce the cost of home ownership in the low-cost market and to extend the scope of F.H.A. services to large-scale housing operations.

Small residences

For the owner-occupant of a single-family dwelling or apartment accommodating not more than four families, FHA is authorized to insure a mortgage on new construction subject to the following terms:

Coverage—Not over 90 per cent of the appraised value, if this is not greater than $6,000, and not over 80 per cent for valuations between $10,000 and $20,000. Houses worth between $6,000 and $10,000 will be covered for 90 per cent of the first $6,000 and 80 per cent of the remainder.

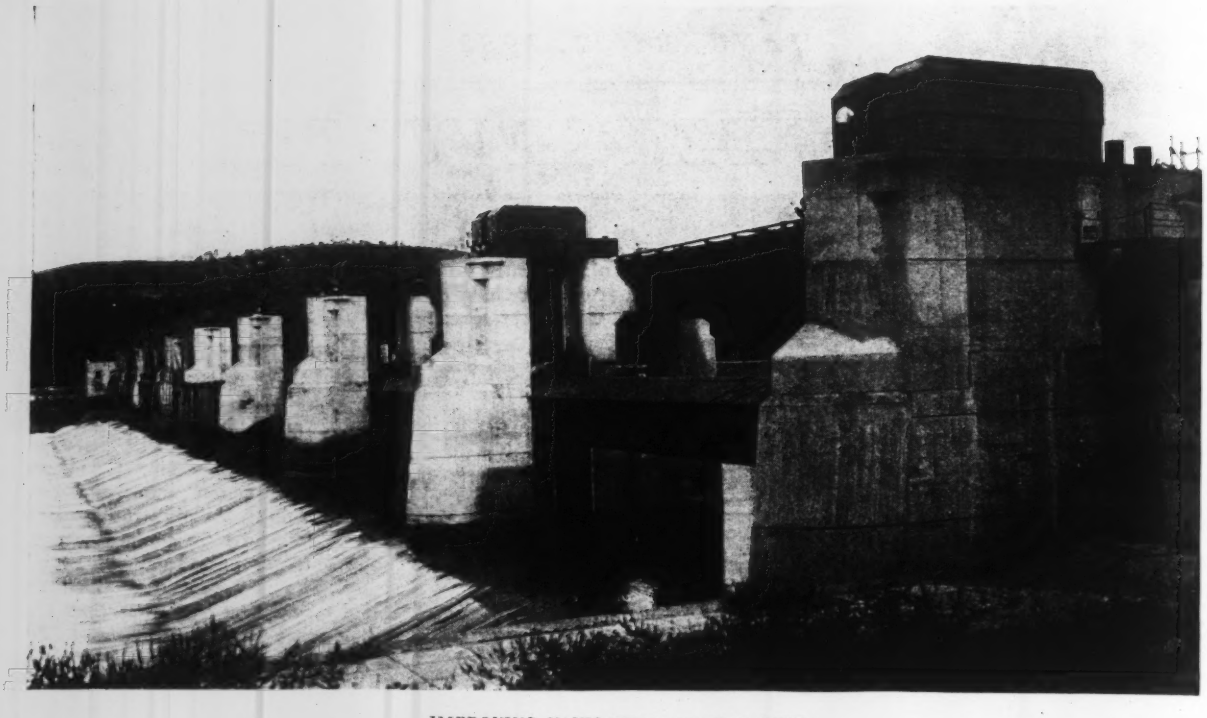
Amortization—Not over more than twenty years, except that until July 1, 1939, this can be lengthened to 25 years on houses costing $6,000 or less.

Interest—Not to exceed 5 per cent, except that under special circumstances F.H.A. is authorized to increase this to 6 per cent.

Service Charge—The former service charge of ½ per cent of the amount of the mortgage is eliminated.

Premium charge—The insurance premium charge ranging from ½ per cent to 1 per cent (F.H.A. has never charged more than ½ per cent) is retained, but it will be based on the unpaid balance of the mortgage, rather than on the face amount. However, this rate is reduced to ¼ per cent on new houses costing $6,000 or less ac-

(*continued on page 126*)



IMPROVING NAVIGATION ON THE OHIO

RECONSTRUCTION of Emsworth Dam on the Ohio River as a movable crest dam will soon be completed at a cost of $2,500,000. The 1,000-ft. dam includes eight vertical lift gates and a fixed weir section near the locks. Each gate is 100 ft. long, weighs 126 tons, and is supported on concrete piers surmounted by a bridge from which a crane handles emergency bulkheads.

These bulkheads, used to replace the gates during repairs or repainting, are made of aluminum. They are 105 ft. long, 12 ft. wide and 6.5 ft. high, but weigh only 15 tons.

The back channel dam consists of six gates, five of which are the same as those used on the main channel. The sixth is an experimental type with swiveling carriages at the ends which permit one end of the gate to be raised higher than the other without straining the gates, thus offering protection against damage from debris on the fill.

In the view above the lift gates are shown in a raised position. The lock is at the far side of the dam.

Mortgage Insurance Agreed On

(Continued from page 125)

cepted for insurance before July 1, 1939. The change in the method of computing the premium charge is also made applicable to future payments on F.H.A.-insured mortgages now outstanding.

Large scale housing

The bill re-writes the section of the Housing Act relating to the insurance of mortgages on large-scale residential rental projects held by public or quasi-public housing agencies or by limited dividend corporations. This protection will now be available also to cooperative societies and private corporations formed to rehabilitate slums or blighted areas if they will accept limitations on their financial structure and rental charges. Projects under this section are limited to a maximum valuation of $5,000,000 each. Loans shall not exceed 80 per cent of the valuation, shall bear an interest rate not to exceed shall pay a premium charge to be negotiated in advance. Construction 5 per cent on the unpaid balance, and costs under this section are limited to $1,350 per room, and provision is made for the release of parts of the project from the blanket mortgage.

Similar terms apply to moderate-sized developments needing mortgages ranging from $16,000 to $200,000 on an 80 per cent basis, with a cost per room not to exceed $1,150. These may be apartment structures or groups of ten or more single-family residences upon which construction has not yet been started. A maximum amortization term of 21 years is prescribed, with interest at not over 5 per cent plus a premium to be negotiated in advance for each project.

Modernization loans

The bill also revives until July 1, 1939 (unless terminated earlier by executive order) the section of the earlier act providing insurance on loans used for alteration, repair or improvement of existing structures to an amount not to exceed $10,000 on any one loan, and for the building of new structures with a limitation of $2,500, applicable to urban, suburban and rural property. The insurance coverage is limited to 10 per cent of the amount of the loans outstanding.

Other provisions

The bill also authorizes formation of national mortgage associations to deal in insured and uninsured mortgages and to make mortgage loans, financing such operations by the issuance of tax-exempt bonds, debentures, and other securities. When financed by the federal government, such institutions are prohibited from initiating loans on properties valued at less than $16,000. Uninsured mortgages are limited to 60 per cent of the property's valuation.

It is also provided that the mortgage insurance activities of F.H.A. shall, after July 1, 1939, be limited to new construction (including that started after January 1, 1937 and completed before July 1, 1939) and to property previously covered by an F.H.A. mortgage.

THE CURRENT TREND

This week's news of contract volume and construction cost factors

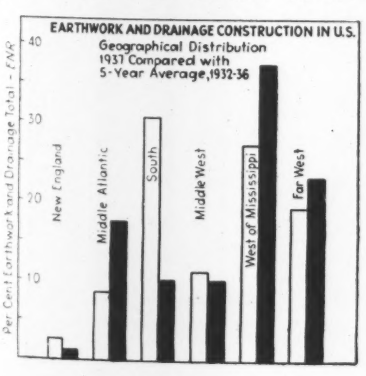
Earthwork, Drainage Volume Lower

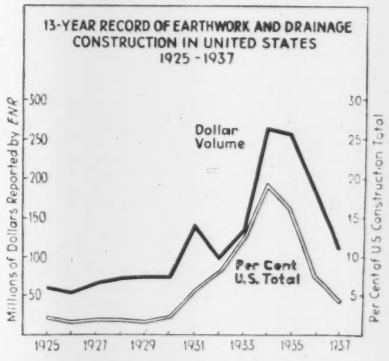
This class of construction represents 4.5 per cent of U. S. total; volume shifts from South to West of Mississippi

Earthwork, irrigation and drainage construction in U. S. totals $110,353,000 for 1937, a drop of 39 per cent from the $181,685,000 reported in 1936 by *Engineering News-Record*. The 1937 volume is the lowest since 1932, but exceeds the annual volume of the years 1925 through 1930. The record year for this type construction, 1934 with $266,431,000, reflects the Tennessee Valley Authority dam construction in the South; Boulder and Grand Coulee Dams in the Far West; Fort Peck and Mississippi River Dams, flood control projects in West of Mississippi states; and large federal dredging projects throughout the country. The low year in the 12 years preceding 1937 is 1926, with $55,000,000 and the annual average volume for the same period is $125,000,000.

Earthwork and drainage construction is 4.5 per cent of the 1937 U. S. construction total, the low since 1929, as reported by *ENR*. The high is 19.6 per cent of the U. S. total, in 1934. From 1925 through 1930, earthwork volume ranged from 1.9 to 2.4 per cent, while from 1931 to date it has ranged from 4.5 to 19.6 per cent of the U. S. construction total.

In 1937 the West of Mississippi states are responsible for 37.5 per cent of the earthwork and drainage construction in the country. Mississippi River dams in Missouri and Iowa; Keystone Dam and irrigation projects in Nebraska; Fort Peck Dam and Buffalo Rapids Irrigation Project in Montana; and the Marshall Ford Dam, near Hughes, Texas built up this volume. Far West accounts for 23.1





per cent of the earthwork construction total; Middle Atlantic, 17.5 per cent; South and Middle West, 10.3 per cent each; New England, 1.3 per cent.

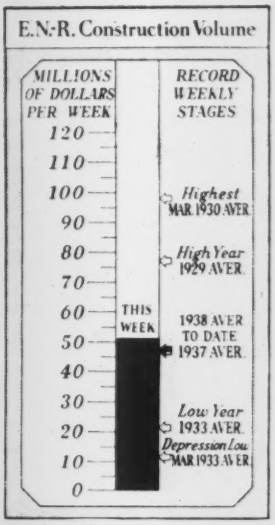
In the 5 years preceding 1937, the South averaged 30.8 per cent of U. S. earthwork construction, due to Tennessee Valley Authority work in 1934, 1935 and 1936. West of Mississippi averaged 27.1 per cent; Far West, 19.2 per cent; Middle West, 11.4 per cent; Middle Atlantic, 8.7 per cent; and New England, 2.8 per cent.

• • •

Building Permits

Building permits in December at $118,763,851 are 70.7 per cent above November, and 42.1 per cent above December, 1936. This value is the second highest of the year, falling only 2 per cent below the March total, $121,069,160. The high permit values in December brought the yearly total to $1,130,624,471, a gain of 15.3 per cent over 1936, and the highest annual volume since 1931. All geographical sections of the nation participate in the increase over last year, except the South Central states, which report an 8.5 per cent loss.

New York City December permit volume, $74,818,104, is 286 per cent above November and 357 per cent above December, 1936. The rush to file permits before the new city building code became effective was responsible for the New York City gain. Building permits in the other 214 Dun and Bradstreet cities, $43,945,747, are 12.4 per cent below November, and 34.6 per cent below December, 1936.



THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending Jan. 28 1937	Jan. 20 1938	Jan. 27 1938
Federal	$896	$2,338	$5,650
State & Municipal	28,797	21,149	23,937
Total public	$29,693	$23,487	$29,587
Total private	15,107	24,182	21,182
TOTALS	$44,800	$47,669	$50,749

Cumulative		
1938 (4 weeks)		$190,186
1937 (4 weeks)		$173,077

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1937 4 Wk.	1938 4 Wk.
NON-FEDERAL	$40,530	$44,399
State & mun. bonds.	42,259 †	30,268
Corporate securities	2,332	10,990
PWA loans, grants.	—4,061 †	1,141
RFC loans	.....	2,000
FEDERAL	.....	.....
TOTAL CAPITAL	$40,530	$44,399

† Represents transfer from federal to private investment financing through sale by RFC of PWA bonds.

ENR INDEX NUMBERS

Index Base	1913	1926
Construction Cost (Jan.)	243.85	117.22
Construction Volume (Dec.)	141	62

• • •

EMPLOYMENT IN THE PRODUCTION of six major construction materials for December is 52.8, as measured by the PWA Projects Division index. This compares with 56.6 for November, and 58.7 for December, 1936. Base 1923-1925 equals 100.

ABERTHAW INDEX OF INDUSTRIAL buildings costs for the quarter ending December 31, 1937, is 195.7, a drop of 7.3 points or 3.5 per cent from the peak at the end of the first quarter of 1937. Lower lumber and steel prices are responsible for the drop.

Civil Engineers Meet at New York

Active discussion centers around a proposal for a federal public works department

Conflicting views as to the desirability of turning all construction operations of the federal government over to a public works department developed at the 85th annual meeting of the American Society of Civil Engineers held in New York Jan. 19-22. As a result, the members present went on record as favoring further study of the subject by the society before it takes a definite stand on the matter. American Engineering Council, in which the society is represented, recently reaffirmed its advocacy of such a department (*ENR* Jan 21, p. 101).

Factors affecting the proposed public works department were presented to the meeting by A. J. Hammond, Chicago, chairman of the public works committee of the American Engineering Council, George W. Burpee, New York, and Donald H. Sawyer, Washington. All three speakers favored the establishment of such a department, though Col. Sawyer called attention to a number of unsettled questions that will affect its organization and success. Discussion revealed difference of opinion as to the need for further investigation of the subject and as to whether such investigation should be carried on by the society alone or in cooperation with the American Engineering Council.

A resolution by Daniel W. Mead recommended investigation of the subject by a committee of the society, with the proviso that no official action be taken by the board of direction for or against a public-works department until the report is received. Arthur S. Tuttle, New York, and L. F. Bellinger, Atlanta, urged that the study be made in cooperation with the American Engineering Council. William Bowie, Washington, declared that the study is likely to be valueless since Congress will act on the question before it can be concluded. H. M. Waite opposed the entire plan, saying that to try to bring together all federal construction activities in one department is tommyrot and that at most some closely related functions now performed by different agencies should be combined. Mr. Hammond made a vigorous defense of the proposed study, referring to the thorough report of 1926 and saying that it needs only to be supplemented by including such construction activities of the government as have been initiated since then. He declared that the society would fail of its duty if it were unprepared with specific recommendations on the subject at a time when it is actively before Congress, a view also held by Col. Sawyer. The Mead resolution was finally adopted.

Society honors

Honorary membership in the society was conferred on three members at the opening session of the meeting and ten members received society medals and awards. The new honorary members are George S. Davison, Pittsburgh, Otis E. Hovey, New York, and J. R. Worcester, Boston. Posthumously, honorary membership was conferred on the late Hunter McDonald of Nashville, Mr. McDonald having died since his nomination was approved.

J. C. Stevens, Portland, received the Norman Medal; Inge M. Lyse and Bruce G. Johnston received the J. James R. Croes Medal and W. W. Horner and F. L. Flynt received the Rudolph Hering Medal; the Thomas Fitch Rowland Prize went to Eugene A. Hardin; the James Laurie Prize to Boris A. Bakhmeteff and Arthur E. Matzke; the Arthur M. Wellington Prize to Capt. E. C. Harwood and the Collingwood Prize for Juniors to Victor L. Streeter.

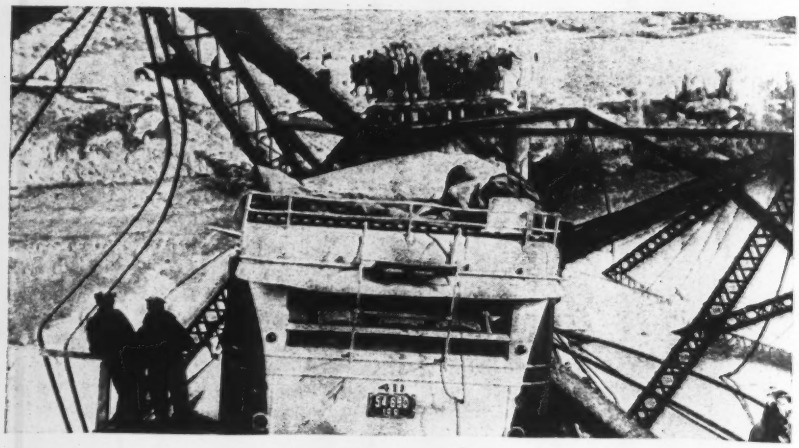
Unusual interest centered in the result of the balloting for president in view of the fact that the name of David C. Coyle had been put in nomination by petition following the announcement that Henry E. Riggs had been chosen as official nominee. In the voting, 3,670 ballots were cast for Dr. Riggs and 740 for Mr. Coyle.

New officers elected in addition to the president are, vice presidents, Malcolm Pirnie, New York, and E. N. Noyes, Dallas; directors, Arthur W. Harrington, Albany, N. Y., James A. Anderson, Lexington, Va., Louis E. Ayres, Ann Arbor, W. W. DeBerard, Chicago, J. Eugene Root, Cincinnati, Ross K. Tiffany, Olympia, and Thos. R. Agg, Ames.

The board of direction at its meeting received the report of the committee on unionization of engineers and voted to publish the findings of the committee in March. Continuation of the study was authorized.

The board also authorized the inauguration of a fellowship in honor of J. Waldo Smith, using the proceeds of the Smith fund, the fellowship to go preferably to a junior member of the society for graduate study at one of the engineering schools.

A report of the technical division meetings will be published in next week's issue.



BRIDGE FAILS WHEN BUS SKIDS

A STEEL BRIDGE 110-ft. long in southeastern Idaho collapsed on New Year's Eve under a motor bus of the Union Pacific system. The bus struck one of the truss members while the driver, according to reports, was endeavoring to avoid an approaching car driven without headlights. Although the bus dropped partly into the water, the 12 passengers and driver escaped without serious injury.

The bridge spanned the Bear River on U. S. highway No. 91, 2 mi. west of Preston, Idaho. The main span was a pin-connected, steel truss on concrete-filled cylinders; there was one 15-ft. timber approach span at each end. It was built by the county in 1910 and was on a section of the route to be abandoned by a re-alignment on which work is now under way.

At the time of collapse the bridge was posted for a 10-ton load limit. Press reports of the accident said that in swerving to avoid collision "the rear wheels of the vehicle rammed a steel girder of the bridge which buckled under the impact."

Operating New Plants Is Described

New York State Sewage Works Association celebrates tenth anniversary in New York

Operating experiences at some of the newer sewage treatment plants in the metropolitan area were discussed at the annual meeting of the New York State Sewage Works Association, held in New York City Jan. 20-22. The occasion was marked by the celebration of the tenth anniversary of the Association, which now boasts a membership of almost 500. Plans for future development, outlined by A. S. Bedell, secretary-treasurer of the organization, include formation of regional chapters within the state.

Recipients of the Kenneth Allen Memorial Awards presented each year by the association were: Charles L. Walker, professor of sanitary engineering at Cornell, for his research on the effect of activated carbon in sludge digestion; and Wellington Donaldson, engineer of the New York City department of sanitation, for his paper on operatica of the Coney Island treatment plant.

Describing sludge digestion experience at Rockville Center, N. Y., C. George Anderson, superintendent, recommended cleaning tanks every third year. He found that grit deposits would accumulate at the tank outlet pipe and hinder sludge withdrawal. He also reported that when the digestion tanks were first started, without previous seeding with ripe sludge, the supernatent liquor was of such poor quality that when it was returned it upset operation of the activated sludge units and caused bulking. No more difficulty is experienced with return of supernatant liquor, which now has a B.O.D. varying from 200 to 1200 p.p.m. and a suspended solids content averaging 850 p.p.m.

At the Coney Island plant, where three 300-hp. sludge gas engines are operated to produce electric power, it has been found that 25.9 cu.ft. of gas are required for the generation of 1 kw.-hr. of energy, according to Wellington Donaldson and Henry Liebman, sanitary and mechanical engineers, respectively, of the New York City Department of Sanitation. The sludge gas has a B.t.u. content of 650 units per cubic foot, and it has been found that the plant equipment can produce one brake-horsepower per 90 B.t.u.'s delivered. The 20-m.g.d. Coney Island sedimentation plant has eight digesters of 56,000 cu.ft. capacity each and sufficient gas is obtained for operating purposes so that it has not been necessary to use the standby commercial gas service.

R. H. Gould, chief engineer of the New York City Department of Sanitation, in describing the start of operations at the Ward's Island activated-sludge plant last October, said that a well-clarified effluent was obtained in three days. One of the principal difficulties was the removal of large quantities of grit, coal, bricks, and other debris washed into the Bronx grit chamber when it was first placed in operation. Mr. Gould reported that to date 1,793,000 cu.ft. of sludge, averaging 5.7 per cent solids, had been taken out to sea in 15 barge loads.

The work of Pasteur on fermentation was credited as the foundation for biological sewage purification processes by Earle B. Phelps, professor of sanitary science at Columbia University. Dr. Phelps traced the development of biochemistry applied to sewage treatment and stated that in recent years very little has been added to the fundamental knowledge of processes but that progress has been made in refinement of control and application of these processes.

Other speakers on the program included George B. Gascoigne, Cleveland, consulting engineer, who discussed the role that federal, state and municipal agencies play in the construction and operation of treatment works, and Prof. C. L. Walker of Cornell who outlined the work to be undertaken in the new short school for sewage plant operators. The course will be given for two weeks starting March 14.

Officers elected for the coming year are: president, F. J. Biele, consulting sanitary engineer of Huntington, N. Y.; vice-president, N. L. Nussbaumer, Buffalo consulting engineer; secretary-treasurer, A. S. Bedell, chief of the Bureau of Waste Disposal of the New York State Department of Health.

• • •

Victor Gelineau Dies

Victor Gelineau, director and chief engineer of the New Jersey State Board of Commerce and Navigation, died at the age of 52 in the Pennsylvania Station in New York City while returning to his home from Washington.

Mr. Gelineau who had been chief engineer of the state board since 1919, had long been active in beach erosion work. He was a member of the federal Beach Erosion Board, and was secretary-treasurer of the American Shore & Beach Preservation Association. He was recently elected president of the New Jersey Association of Professional Engineers and Land Surveyors.

Easement Options Delay Floodways

Effort will be made to separate Morganza and Eudora projects to speed construction start

Washington Correspondence

The Overton flood control act provides that 75 per cent of the easements required for the Morganza and Eudora floodways must be pledged before any construction is undertaken. After eighteen months of effort only 24.61 per cent of the options necessary in the Eudora floodway have been secured. But more than the necessary 75 per cent have been secured in the Morganza area.

An effort will be made at the present session of Congress to amend the act to permit construction of the Morganza floodway, on the lower Mississippi, to proceed without waiting for acquisition of further easement options on lands needed for the Eudora floodway. The measure is strongly supported by Louisiana interests, but is as strongly opposed by Mississippi interests. Rep. Whittington of Mississippi, chairman of the flood control committee, suggests instead that the act be amended so that lands needed for the Eudora diversion may be condemned and acquired.

Opposed viewpoints

Louisiana interests contend that the Morganza floodway will benefit Mississippi and that opposition to its separation from the Eudora diversion is for the purpose of bringing pressure on residents affected by the Eudora project. Representative Whittington claims that the two diversion projects are inseparably linked.

Until the controversy is settled, further flood control work on the main stem of the Mississippi below the Arkansas river is at a standstill. Work will proceed in the Atchafalaya basin, where an additional outlet to the Gulf is to be cut at Wax Lake, west of Morgan City. Some levee work and dredging in the Atchafalaya remain.

Work will proceed also on two new cut-offs just below the St. Francis river—at Sunflower bend and at Jackson point.

Cut-offs successful

Study during the highwater of 1936 of the operation of the cut-offs already made between the Arkansas and the Red shows that they greatly expedited discharge of flood waters. The Morganza floodway will reduce by 115 miles the distance the water has to travel. Until it is built a thorough test of the cut-offs cannot be made.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

RENTAL SCHEDULES averaging $4.43 per room per month have been set by Nathan Straus, administrator of the U. S. Housing Authority, for the Lockefield Garden project at Indianapolis. This is the PWA housing development which recently was checked over by building experts to determine the cause of leaking walls which had resulted in damage to plaster and floors.

THE NORRIS RESOLUTION directing the Federal Trade Commission to make an investigation of the operations of the Tennessee Valley Authority was favorably reported to the Senate Jan. 21 by its committee on agriculture and forestry, with the authorized appropriation to cover the cost of the investigation reduced from $200,000 to $100,000.

ARTHUR E. MORGAN favors formation of regional agencies for the control of water development with functions limited to planning and regulation, he stated in a written report to the House Rivers and Harbors Committee. He asserted the need for central planning but said that actual design and construction should be carried out by local agencies. Functions of the central agencies should be, he said: to provide technical assistance and advice to local agencies; to develop over-all plans for water control of other than local character; and to provide supervision and regulation to protect the public interest in a manner similar to that of the zoning and building inspection departments of the city. Demonstration projects would also be suitable activities for such planning agencies, he said.

Mr. Morgan held that "whenever hydroelectric power can be economically produced without sacrificing greater values, it would be an unjustifiable waste of the public resources to omit water power development." He emphasized, however, that power developments should not be allowed to obscure or interfere with other aspects of river developments.

A FEDERAL AID authorization bill for the fiscal years 1940 and 1941 with the amounts left blank, to be filled in later by the appropriations committee, was introduced into the Senate by Senator Hayden, Jan. 24.

ELECTED BY ROAD BUILDERS

MURRAY D. VAN WAGONER was elected president of the American Road Builders Association at its Cleveland convention. Mr. Van Wagoner is state highway commissioner of Michigan.

The following vice-presidents were elected: Northeastern district, Paul B. Reinhold, of Pittsburgh; Southern district, E. D. Kenna of Jackson, Miss.; Central district, Lion Gardner, Columbus; Western district, Stanley Abel of Taft, Calif. James H. Macdonald of New Haven, Conn. was elected treasurer, and the following directors were elected: A. W. Brandt, Carl W. Brown, Frederick Hoitt, C. J. Sherlock, Charles M. Upham, Charles D. Vail, H. C. Whitehurst.

Barge Tests Feasability Of Pontoon Bridge

To ascertain how wind and wave action would be likely to affect a proposed pontoon bridge across Lake Washington at Seattle, the Washington state highway department has anchored a concrete barge in 65 feet of water 2,000 ft. offshore and on the proposed route. Various instruments record daily weather conditions and their effect on the scow, which is about half as long as the proposed bridge pontoons. Tensometers record tension put on the cables of the scow. On both sides of the vessel, outrigger devices show, by gages, the list of the barge and the height of the waves. An anemometer on top of the barge records wind velocity.

The highest wave so far recorded is 3.5 feet; the strongest wind, 45 miles an hour. First readings were taken Dec. 15 and study will continue until March 31, covering the months in which the worst weather usually is experienced.

Governors Meet President On New England Compacts

A visit to Washington last week by governors of all the New England states, during which they conferred with President Roosevelt, brought little apparent progress in the solution of the flood control problem on the Connecticut and Merrimack rivers. Congress refused to ratify interstate flood control compacts on these rivers last year because of provisions retaining state control of power.

Although no official announcement was made after the meeting, it is believed that the principal topic of discussion was the revised flood control policy proposed last week by the President, which would permit construction of revenue producing multi-purpose flood control projects by the federal government, under certain circumstances, without local contribution.

Governor Cross of Connecticut, reported that the conference resulted in a deadlock. "It is generally conceded," he said, "that the power question is now relatively unimportant. The major question is whether the title to the reservoirs shall rest with the federal government. The problem is to find a formula which must be in the nature of a compromise."

Of the eleven reservoir sites included in the two compacts, six on the Connecticut and one on the Merrimack could be enlarged beyond the size necessary to provide flood protection. Army engineers have reported as a result of a survey of the valley. The amount of power that would be made available is indefinite, depending on the size of electrical equipment installed; this in turn would be determined after a study of the possible market and the cost of serving it.

• • •

Sewage Works Federation Is Self-Sustaining

The Federation of Sewage Works Associations, which was formerly underwritten in part by the Chemical Foundation, is now financially independent and closed the year with a net profit of $1.600, it was revealed at the meeting of the federation Jan. 21. Since the federation was organized in 1928, with a membership of 364, it has grown so that it now includes 30 affiliated organizations in 38 states with a membership of 2,358.

Instead of a national convention this year, it is planned to issue a decennial anniversary issue of the *Sewage Works Journal* containing papers by 33 authors on progress of the art.

All present officers of the federation were re-elected.

Fourteen Million Damage In December Flood

Damage done by the storm that swept northern California Dec. 10-13 was made the subject of a statewide survey, and estimates just published put the total figure at $14,635,000. Figures were compiled by counties: Butte County headed the list with losses exceeding $2,000,000, and twenty counties suffered damage exceeding $100,000 each. Included in the total is a $2,000,000 loss, not distributed by counties, sustained by railroad and utility companies and public property.

• • •

TVA Constitutionality Upheld by Court

(continued from page 125)

power . . . and thereby to assist in liquidating the cost or aid in the maintenance of the project."

The power companies contended that TVA was violating this provision and was operating its dams primarily for the generation of power.

The court pointed out that the water bulletins of the authority order that the dams be operated, first, to protect navigation; second, for flood control, and only as it might be consistent with these purposes, for power generation. It also pointed to testimony by members of the committee on water control operations that the actual operation of the dams had carried out these instructions.

It was further pointed out that all contracts for the sale of power were specifically made subject to the provisions of the TVA act.

Act held constitutional

On the question of constitutionality, the court took into consideration the language of the act in its statement of purpose and in Section 9-A and other sections, all leading to the conclusion that the sincere purpose of the act was primarily to protect navigation and prevent floods and only secondarily to generate power. The act was therefore held valid under the public defense and general welfare clauses of the constitution.

The court followed the Ashwander case in holding that, since the dams were constructed under the authority of a valid act, the generation and sale of power constituted a regular exercise of the government's power to dispose of its own property.

Wendell L. Willkie, president of the Commonwealth & Southern Corp., said that the case would be appealed to the Supreme Court.

TVA to Negotiate Utility Purchase

The TVA Board of Directors has authorized D. E. Lillienthal to start negotiations with private utility companies and with municipalities, cooperatives, and other public agencies, with a view to the possible sale of utility properties to the public agencies and to TVA. He is also authorized to consult with interested agencies of the federal government.

Senator Norris announced Jan. 24 his intention to introduce an amendment to the TVA Act which would authorize the Authority to purchase private utility lines.

A White House conference will be held Jan. 27 to discuss a plan proposed by Governor Browning of Tennessee for joint acquisition by a state agency and TVA of facilities owned by the Tennessee Electric Power Company.

Billion Gallons of Sewage In New York Waters

Eighty-six per cent of the communities in the New York metropolitan area are violating the conditions of the Tri-State Compact, which was designed to eliminate pollution of waters in and round New York. According to a report of the Interstate Sanitation Commission, submitted to the governors of New York and New Jersey, 1,066,454,000 gallons of untreated sewage pour daily into the metropolitan waterways. In addition, 542,416,000 gallons of effluent from disposal plants are discharged into these waters.

The Interstate Sanitation Commission was set up under the terms of the Tri-State Treaty, which established an interstate sanitation district embracing the metropolitan waters. The treaty was approved by New Jersey in 1935 and by New York in 1936. Connecticut has not yet acted on the treaty, but the Connecticut tri-state treaty commission is cooperating in the pollution control activities of the Interstate Sanitation Commission.

According to terms of the treaty, waters in the metropolitan district have been divided into classes A and B. Sewage must be treated to meet class A requirements when it is discharged into waters used primarily for recreation, shell fish culture, or fishing.

Bonneville Power Rates To Be Fixed Soon

Flat rate per kilowatt-year is being considered to develop the base load

Washington Correspondence

Applications for power from the Bonneville project, now fast approaching completion, are being received in considerable numbers, according to J. D. Ross, administrator of power distribution, who spent last week in Washington to appear before Congressional appropriation committees in support of a budget item of $1,450,000 for the construction of transmission lines to carry Bonneville current. To date reservations have been made for a total of 234,700 kw. to serve a population of 635,964 within transmission distance of power, and a number of industrial plants are also interested.

No actual contracts can be signed until a rate is set for power. This awaits a formal allocation by the Federal Power Commission of the proportion of costs to be charged to power. During his Washington visit Mr. Ross spent considerable time with the commission and an early announcement on rates is anticipated.

Although no definite decision has yet been made, the idea of making a flat rate per kilowatt-year to all types of purchasers is being given serious consideration. This would automatically reduce the kw.-hr. rate to process industries, pumping districts, and private utilities utilizing Bonneville as a source of base-load power, and would at the same time give wholesale purchasers the greatest possible inducement to increase the load factor. The rate would be applied to the maximum demand and would apply regardless of the drop in consumption during periods of slack demand.

In determining the rate the following method would probably be used: Charges would be computed on the basis of 3½ per cent interest on the cost of power facilities and amortization in 40 years, amounting to 1.18 per cent annually, or a total of 4.683 per cent. To this sum would be added the annual cost of operation and maintenance, and the whole amount would be divided by the capacity of the plant to determine the rate. Exactly what capacity figure would be used is still undecided, but it is probable that the output of either four or six units (ultimate development calls for ten 43,000-kw. units) would be adopted as a fair average.

News continued on page 159

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Bond Protection Needed

Sir: The editorial appearing in the Jan. 13 issue of the *Engineering News-Record* captioned "Protect the Public" is indeed timely.

Forty-three states and the federal government require not only protection for the performance of the contract, but also for the payment of labor and material bills through security in the form of corporate surety bonds. At the present time, Credit Men's Associations are making very definite efforts to obtain the same protection in New York State and New York City.

Some supervising officials in the state, however, not only recommend doing away with the protection which the state may obtain from private sources, but turn a deaf ear to the repeated efforts of labor and material men to improve the inadequate protection given them under the existing Lien Law. The only protection that labor and material now have in this state is an interest in the unexpended balance in the hands of the state after the construction work is completed. The inadequacy of this protection is evident from an examination of the unsatisfied liens on the lien dockets of both the state and the cities of New York.

This picture is forcefully brought out in the report of the joint legislative committee on state fiscal policies presented to the Governor and state legislature on January 5 of this year. An abstract of this report follows:

". . . . we want to call attention to losses which have been sustained by material men in connection with state contracts. The records of the Department of Audit and Control would indicate that during the period from Jan. 1, 1927 to Nov. 4, 1937, material men have suffered losses in excess of three million dollars. The language of the lien law intended to give protection to material men gives, in fact, no protection in cases where the contractor defaults and where such protection is most needed. We believe that serious thought should be given to curing this defect in the lien law or determining some other method of protecting material men against such losses."

The Board of Estimate now has the power to correct this situation in New York City, as under the new charter, power is vested in that body to determine the security which must be provided by contractors undertaking public work. The requirement of a labor and material bond in addition to a performance bond gives the usual and time proven method of protecting both the city and labor and material interests.

GREGORY, STEWART & MONTGOMERY
Counsel New York Credit Men's Assn.
New York, N. Y., Jan. 20, 1938.

Profit from Sewage Treatment

SIR: I have read with very great interest the article entitled Salvage from Sewage? by Dr. Willem Rudolfs. (*ENR* Dec. 30, 1937, p. 1055). Whilst sharing with Dr. Rudolfs a desire for a greater utilization of byproducts present in sewage, I would remind your readers that the lure of making a profit out of sewage purification has in the past caused much loss of public money in this country.

It is true to say that experience in England has shown that the sewage farm which could yield a fair profit could rarely produce evidence of having efficiently carried out its main purpose of sewage purification, and for the same reasons I would regard with suspicion the effluent from an activated sludge plant which had been designed with the primary object of supplying fertilizer.

Provided it is recognized that the manufacture of byproducts is secondary to the main purpose of sewage purification, I have every sympathy with efforts to promote a greater development of their present uses. Although we in Birmingham were responsible for the initiation of the use of sludge gas for power purposes, I confess that to use methane on a large scale in internal combustion engines appears to be wasteful when one thinks of the possibilities for its better use in chemical manufacture.

I agree with Dr. Rudolfs upon the need for further research as to the possibility of using different cultures or organisms by stimulation or changing environment conditions, and in this connection I would suggest that gas production is not a sufficient index as to how far sludge digestion should be carried. A sludge which will dry readily and produce a fertilizer reasonably free from weed seeds requires to be subjected to a longer period of digestion than that associated with active gas production.

Generally speaking, the recovery of single byproducts from that heterogeneous mass called sewage sludge is so beset with difficulties that I would regard with more favor efforts directed towards encouraging a back-to-the-land movement of the whole mass, and in this connection a memorandum was recently prepared upon the use in Great Britain of sewage sludge as a fertilizer. [The memorandum points out that large quantities of dried sludge would be useful in compounding fertilizers if it were not for the unfortunate fact that such additions retard the water solubility of phosphates. In England nearly all compound fertilizers contain phosphates guaranteed to be water-soluble, a characteristic to which farmers attach great importance. Therefore, to create a market for sludge it is recommended that a reliable agency be employed to carry out tests and disseminate information regarding its value as a fertilizer for various crops and soils.—Editor.]

A powerful argument in favor of the use of sewage sludge as a fertilizer is the conservation of phosphate. There is no fear of a world shortage of ammonia, but the known deposits of phosphate have suffered marked depletion within the past fifty years.

H. C. WHITEHEAD
Engineer to the Board
Birmingham Tame & Rhea Drainage Board
Birmingham, England

Sir: Dr. Rudolfs outlines many possible valuable byproducts from sewage treatment and in the future these will merit and receive much attention, especially if they can be obtained without further complicating treatment methods. It is best to anticipate, however, that they will come as a result of and not at the sacrifice of proper treatment. Experience to date on the engineering economics of byproducts from sewage treatment is too often somewhat befogged by

methods of bookkeeping. Therefore, it is not too easy to predict the future in this direction.

More essential to real progress in a grand clean-up of pollution than the recoveries that can be made is that sanitary engineers cease to be apologetic about money spent for sewage treatment, employ sanitary methods to create sanitary conditions, and measure the worth of sewage disposal in terms of accomplishment rather than in dollars and cents. Why should a "million dollar" sewage disposal project be considered more costly than a "million dollar" city hall or courthouse if the need be there?

In order to popularize sewage treatment the engineer must better impress the layman with the idea of a principle, and not just a structure, or a derivative from a waste product. This broadly implies sewage treatment primarily for sanitation or correction of pollution.

With an abundance of raw materials in this country and well developed technological methods employed by industry only those sewage byproducts which come about without additional effort in the natural path of normal methods can have any immediate promise.

S. I. ZACK, SANITARY ENGINEER
Filtration Equipment Corporation
New York, Jan. 7, 1938

Construction Expenditures

Sir: That the welfare of the construction industry is essential for the welfare of the nation as a whole can not be denied, but few will agree that its importance is as great as is indicated by William S. Parker in his article "Construction and National Income" in your issue of Dec. 16, 1937.

According to his figures, the total income resulting from the construction industry in 1928 was about one half of the total national income. The calculations are based on three assumptions, with two of which there can be no quarrel. Any other reasonable estimates taken for national income and total construction will give approximately the same results. It is in the third assumption, the estimate of the secondary effect of construction expenditures on national income, that the trouble exists. Mr. Parker draws curves based on ratios of secondary expenditures to primary of $1\frac{1}{2}$ and 2. That is, the total income of the country is increased by $2\frac{1}{2}$ or 3 dollars for every dollar spent on construction. On first glance this appears reasonable. Reliable statistics show that for every man directly employed on construction $2\frac{1}{2}$ more are employed in the manufacture and transportation of materials used on the job, and an additional 2 or $2\frac{1}{2}$ men are given employment in other industries due to the outward spread of the total money expended on construction. Thus in total about 6 men are employed if one man is *directly* employed on construction work.

However, the expenditure on construction, 12 billion in normal times, represents not only the one man directly employed but also the $2\frac{1}{2}$ men working in the manufacture and transportation of the materials he uses. Mr. Parker points this out himself in his article.

The multiplying factor is therefore not the $2\frac{1}{2}$ or 3 he gives, but actually 6 divided by $3\frac{1}{2}$ or somewhere between $1\frac{1}{2}$ and 2. These ratios are more in accordance with those used by economists. Keynes, the British economist who is said to have been instrumental in bringing about the increase in public works by the Federal government, places the multiplier at 2 in depression. If the construction is a part of public works and is financed partly by immediate taxation, this factor is even less.

If, as in 1928, the total construction was 12 billion, the effect on total income would be 24 billion at most. According to Mr. Parker, the secondary effect alone would be this amount, and the total effect would be 36 billion. Thus the drop in construction does not account for 73 per cent of the drop in national income as given in the article, but for less than 50 per cent (37 if the $1\frac{1}{2}$ factor is used) and this much only when considering secondary benefits which accrue no matter in which industry money is spent.

This is not an attempt to show that the construction industry is unimportant for recovery. The fact remains that it is the second largest in the country. Its condition is therefore of primary significance, but its effect should not be overestimated.

DANIEL C. DRUCKER
New York, N. Y., Jan. 10, 1938

Stadia Technique

Sir: Mr. J. A. Oakey, in his article, "A New Stadia Technique," in the Dec. 23 issue of *Engineering News-Record*, lists four steps required in taking an ordinary stadia observation. By the following method, which I have never seen advocated or explained in any of the texts on plane surveying, three of these steps may be eliminated, and a check may be obtained on the stadia reading which is not obtained by the ordinary method.

Let us assume that an ordinary Philadelphia level rod or stadia rod and a well adjusted modern transit with stadia wires equi-distant from the center horizontal wire are available. The instrument man measures his H.I., sets the center wire on the rod, and leaves it at that point. All he has to do now is read the upper and lower stadia wires and record them in the proper column of his field notebook. They may be recorded as a fraction with the top wire reading above and bottom wire reading below. The differences between the two readings can be computed in the field or this work can be done in the office. If the instrument man cannot see the H.I. on the rod because of brush, he can read an even number of feet above it and make a corresponding entry in the field book.

After recording the reading of both wires, without moving them in any way, the instrument man signals his rodman to go to the next point and records the azimuth and vertical angle while the rodman gets into position.

The advantages of this method are that the instrument wires are set only once for any one shot, that there is a certain check on all the work, and that no calculations of any kind are required in the field.

Mr. Oakey's method is certainly an advantage and time saver to the man constantly engaged in stadia work, but the ordinary surveyor or engineer could not very well alter his transit and get a special rod for just a few hours or a few days work. By his method he has no check on his stadia reading unless he reads and records the middle wire and sees that it is exactly one-half of the top wire reading.

MILTON R. EVA
Greenland, Mich., January 1, 1938

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Editorial Offices at 330 West 42nd Street, New York

JANUARY 27, 1938

HIGHWAYS ARE IN THE FOREFRONT again this week. The convention of the American Road Builders Association and its great biennial exhibition of roadbuilding materials and machinery made history. Primary credit for novelty and impressiveness goes to the exhibits. Something of this is indicated in the review in this issue, though description cannot give the visual impression of the hundred of machines of unprecedented size and variety that crowded the exhibition floors. In comparison with the machinery exhibition, the convention proceedings contained less inspiration. Yet, though the equipment engineer and the materials technologist outdid the highway engineer in their claim to immediate attention, the 85 papers and committee reports offer much that will count heavily in better roadbuilding to come.

The Road Show

THE TWENTY THOUSAND who attended the Road Show at Cleveland last week saw the greatest array of construction equipment ever assembled under one roof. They saw the weapons of construction—the artillery batteries of shovels, pavers, scrapers and graders, trucks and tractors; the small arms of pumps, compressors, motors and countless small tools; the supply of materials and accessories. But these are weapons of creation, not destruction. Directed by the general staff of engineering and construction skill and manned by the infantry of construction labor, they build new and useful works for the benefit of mankind. The Road Show was more than a display of equipment and materials; in depicting engineering and manufacturing advance it symbolized progress, employment and the great business of creating beneficial works. It breathed optimism and faith in the future.

It Can Be Done

CHICAGO HAS REPORTED to the Supreme Court that its program of sewage purification has progressed far enough to make it safe to reduce the diversion of water from Lake Michigan down the Illinois River to 1,500 sec.-ft. by the end of 1938, as required by the court's order. Since the work started $150,000,000 has been spent. Completion of plants now under construction will permit the treatment of 75 per cent of the sewage from an area having a population of 4,587,000 and an industrial load equivalent to 1,805,000 additional population. When the program was inaugurated skeptics said that clearing up pollution on such a large scale was out of the question. Chicago has demonstrated that it can be done, and thereby has also demonstrated that no pollution problem is too great or complex to be solved. Streams that have been open sewers can be made clean, regardless of industrial pollution, if local communities accept responsibility and set about the task in determined manner.

Work Ahead

PLANT IMPROVEMENT plans announced by the United States Steel Corporation last week constitute a significant index of the amount of construction work waiting to be done in order to bring the country's productive plant up to modern condition. The corporation has been active in rebuilding and refitting its plant throughout the depression, yet it proposes to do eighty millions more this year. Those industrial concerns that were not able to keep up betterment operations during the depression—and they are many—must have relatively more to do in the way of catching up. The pressure of this necessity is reflected in the sharp upward trend of industrial construction since the early part of 1935, but the work of the past three years has by no means made up the accumulated deficit. Much additional industrial and utility construction is required to bring our facilities up to full efficiency and capacity; it is one of the largest elements of the construction backlog.

Power Cost Data

VALUABLE DATA on power costs are being assembled by the power division of the American Society of Civil Engineers. At the meeting of the society held last week a full day was given over to a symposium on cost of power in which attention was centered on the cost of generating steam and hydro power and on related subjects such as costs when hydro and steam stations are integrated, and the effect of obsolescence and depreciation on cost accounting. Such figures are of inestimable worth to engineers in their studies but they also serve to show clearly how impossible it is to set up power "yardsticks" that have any practical meaning. The cost of power to the consumer in any one region depends on many diverse factors, including the cost of generating in a group

of interconnected steam stations or steam and hydro stations, distribution costs, size of area served, system load and other variables. In no two regions, or for that matter two plants or systems, are these factors alike; hence it is impossible to say that because costs in one region are at a certain figure a higher figure in an adjoining region is unfair to the consumer or a lower figure unfair to the producer. Much is being said in these days about the use of power "yardsticks" by governmental agencies to measure the fairness of private power rates. In theory the plan is attractive but the test of fact shows that it is impracticable.

Structural Fatigue

IN A BRILLIANT INVESTIGATION reported to the American Society of Civil Engineers last week Prof. Wilbur M. Wilson has explored some of the conditions under which endurance failure may occur in structural steelwork. He shows that the strength of steelwork under alternating or repeated stress is much lower than its static strength, which is the basis of design and proportioning today. This fact is so fundamental that every engineer will at once ask how it affects his working stresses and his capacity ratings.

To look at Prof. Wilson's results briefly: The tests were made on riveted joints, and measured the load that when repeated or alternated two million times would cause failure. The failure stress on the net section through the rivets (failure load divided by net area) was about 26,000 lb. per sq. in., the same for nickel steel and silicon steel as for soft carbon steel. Failure always occurred in the plates, never in the rivets, even in joints designed for rather high shear and bearing values. The failure stress was well below the endurance strength of specimens unbroken by holes and with polished surface; it may be inferred that both the stress concentration near the rivet holes or the surface roughness of the rolled steel were responsible for the reduction.

These significant results indicate that a structure under repeated or reversed stress is weaker than has heretofore been believed, and that it must be made one-sixth to one-fourth heavier to guard against eventual failure. Further, the use of high-strength steel does not help matters. What do these facts mean with respect to our actual structures?

First it may be noted that since the tests dealt with joints only the results do not apply to the solid body of a member, away from a joint or other discontinuity. As concerns the joints, the tests did not show how great a stress would be required to cause failure at a smaller number of repetitions than two millions—say 50,000 or 500,000. They supplied some information on the effect of large stress pulsations but none on the effect of small pulsations. Nor did they show whether fatigue would result from occasional high stresses during repetition of a stress below the endurance limit.

In practice few members are subject to alternation or repetition of their full designed stress. Under partial alternation or repetition the failure limit is higher, and the 26,000-lb. figure found by Prof. Wilson is therefore unduly low for use in practice. In fact it may prove that the actual endurance limit for practical conditions of stress variation the yield point.

Further, where alternating or repeated stress occurs, as in bridge members, maximum stress is attained very infrequently. This being so, the question is whether stress repetitions well below the endurance limit with only occasional maxima reaching or exceeding the endurance limit have a damaging effect. Prof. Wilson's results, as already stated, do not cover this point, but general endurance-test experience indicates that there is no damaging effect under such conditions.

Endurance-test experience also suggests that stressing below the fatigue limit, however long repeated, does not cause any injury or deterioration in the material. If this be true, and if the safety margin keeps the stresses below the fatigue limit, except for unforeseen and infrequent contingencies, is it proper to reckon safety margins from the Wilson fatigue limit, or does not safety actually prevail up to the static failure point?

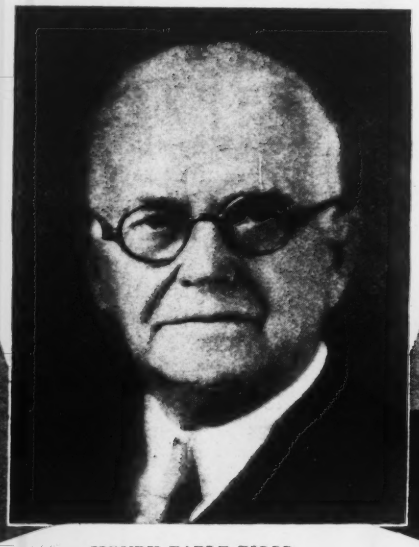
The strongest teaching of the Wilson findings is that the structural engineer must give careful consideration to stress concentrations. It appears probable that in the reported tests the complex and high concentration of stress at the rivet holes was responsible for the low fatigue values found. Notches and reentrant angles in cutouts may be even more serious in their effect, and the structural engineer will gain in security against fatigue if he avoids such details.

Great extension of the test work begun by Prof. Wilson will of course be necessary before the structural engineer will have a more definite guide to the effect of fatigue action in structures. What happens in members subject to vibration, where the pulsations of stress are apt to be low in amount but great in number; what recovery of strength occurs during periods of rest between periods of stress repetition, and how fatigue is related to the type of progressive cracking that occurs under local distortion, as at stringer ends; such questions as these await fuller exploration.

In the meantime comparison of the fatigue-test conditions with the conditions of structural service does not indicate that any major change in design methods is called for or that more conservative strength rating than now practiced is required.

PICTURES IN THE NEWS

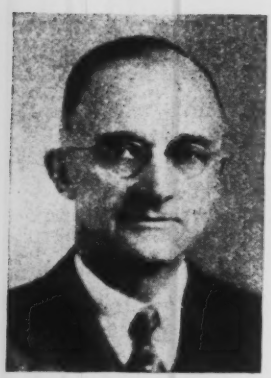
EDWARD N. NOYES



HENRY EARLE RIGGS

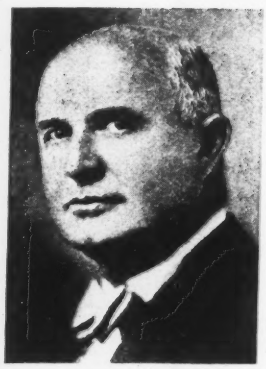
MALCOLM PIRNIE

AMERICAN SOCIETY of Civil Engineers elects. Mr. Riggs is president for 1938, and Mr. Noyes and Mr. Pirnie are vice-presidents for 1938-39. Below are the newly-elected directors, who will serve two years.

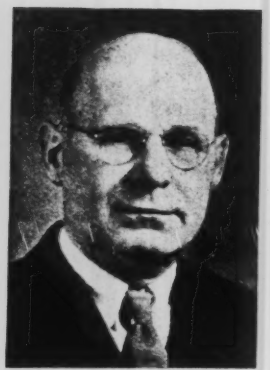


LOUIS E. AYRES

ARTHUR W. HARRINGTON



ROSS K. TIFFANY



THOMAS R. AGG

W. W. DE BERARD

JAMES A. ANDERSON

J. EUGENE ROOT

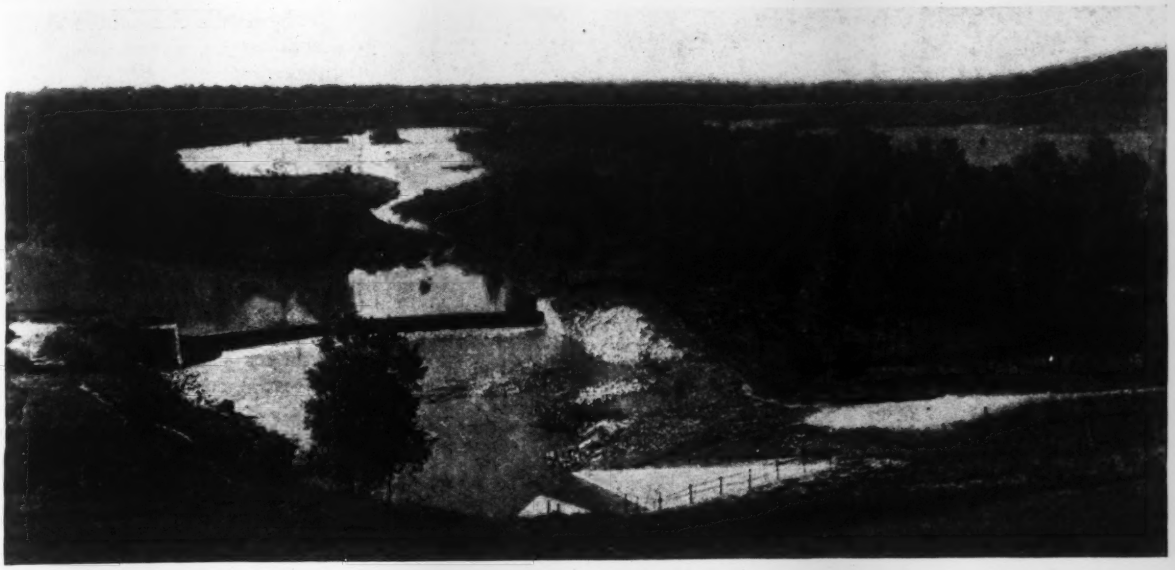


FIG. 1. LOW-WATER RECREATIONAL PONDS ARE CREATED BY SMALL DAM IN FLOOD CONTROL RESERVOIR

Recreation Dam Built in Miami Reservoir

by C. H. EIFFERT
Chief Engineer, Miami Conservatory District, Dayton, Ohio.

Low concrete dam, submerged in time of flood by backwater from flood-control dam, creates attractive ponds in Englewood Reserve

ABOVE the Englewood dam of the Miami Conservancy District are a number of ponds created by the removal of material for the construction of the dam. Surrounding them is the Englewood Reserve, an area of 900 acres, a partly-timbered tract which the district intends to retain permanently. Its rolling wooded slopes together with the ponds and river make it a very attractive picnic and camp ground which has been accessible to the public for the past 15 years.

The Miami Conservancy District was organized for flood control and while it has funds to properly care for and maintain its property, it cannot finance the construction of extensive facilities for recreational purposes. The advent of the CCC organization offered an opportunity to have such facilities provided for the people of the Miami Valley without direct cost to the local taxpayers. A camp was established near the Taylorsville Dam and the force is engaged in the preparation of camp and picnic grounds in the wooded areas at the Englewood and Taylorsville dams under the direction of the National Park Service.

One of the principal features of this development up to this time has been the construction of a concrete spillway section dam to raise the low water level, in the ponds and river at Englewood, between 5 and 6 ft.

This dam is located about 300 ft. upstream from the upstream end of the conduits through the Englewood flood control dam. It was designed in the office of the Miami Conservancy District, constructed by the CCC in cooperation with the Miami Conservancy District, and construction supervised by the Miami Conservancy District engineering department. As the depth to rock was uncertain, it was designed to be built on gravel with sheet pile cutoff walls. However, when the excavation for the footing was made, it was found that rock could be reached within 2 ft. of the designed bottom of the dam, for the entire length of the structure. It was therefore impossible to drive sheeting and it was decided to increase the thickness of the apron down to the rock. The extra lower section of concrete was made quite lean except at upstream and downstream ends, where the richer mix was carried down to rock.

An interesting and rather unusual feature in the design of this dam was that it was not necessary to provide spillway capacity for the maximum runoff from the 651 sq.mi. of drainage area above the dam, for it is submerged by the backwater of the large Englewood flood control dam whenever any considerable rise occurs in the river.

During the 15 years since this flood control dam was placed in operation, many discharge measurements have been made and an accurate rating curve has been established. The conduits through the large

Fig. 2. Rising stage of the river and backwater from Englewood Dam submerges the small dam. As the outlet conduits in the large dam are about full at this stage the current rapidly decreases as the water rises.

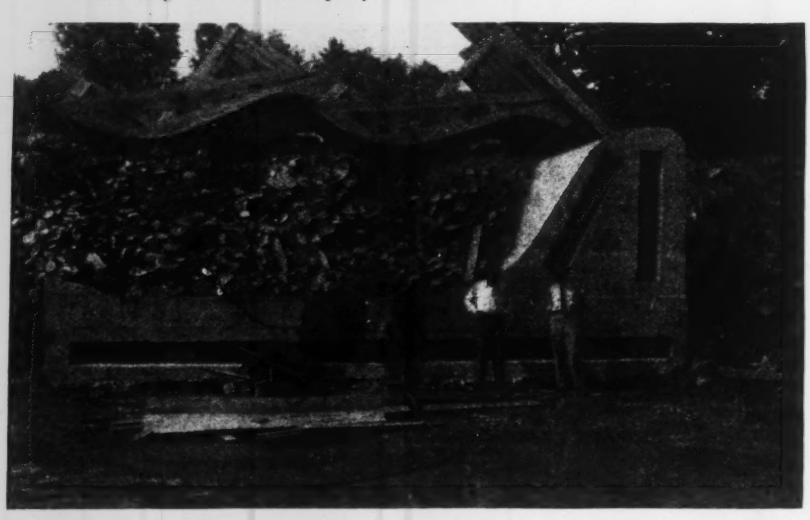


Fig. 3. Cross section of the small dam. Excavation revealed ledge rock only 2 ft. below planned bottom of dam, so the structure was carried to hard foundation, resulting in the thick apron and elimination of the cutoff wall.

dam have no gate control, the discharge being always the same for a given head. As the water begins to rise above this dam there is at first considerable velocity in the channel above the upstream end of the conduits, which, however, grows less as the water rises; when an elevation somewhat above the banks is reached there is very little current at any point except immediately above the conduit entrances.

Calculations for design

The dimensions of the dam were determined by making several trial calculations. It is 150 ft. long between abutments and the tops of the abutments are 6 ft. above the crest of the dam. The levees extending to higher ground are slightly higher than the abutments. It was found that with a 150-ft. length of crest at El. 781, a depth of 6 ft. on the crest would leave only 3 or 4 in. difference in elevation between the water levels above and below this dam. As the levees are between 6 and 7 ft. higher than the crest, it was assumed that when the levees became submerged there would not be sufficient velocity to damage them. The levees were riprapped on top and on the downstream slopes. Their relation to the dam is shown in Fig. 1.

The hydraulic elements involved in determining the proportions of this dam are shown in Fig. 4. The discharge curve for the flood-control conduits plotted against elevations in the basin is taken from actual discharge measurements. The curve showing the discharge over the small dam was calculated by using Hydraulic and Excavation Tables of the U. S. Reclamation Bureau up to the point where it became submerged and above this elevation using King's formula for submerged weirs.

Since the completion of the dam last October it has been completely submerged, including levees, a number of times and readings have been taken during the rising and falling stages above and below the dam. Knowing the discharge through the conduits for any given elevation, it was possible to verify the design by plotting the actual elevations and discharges in Fig. 4, as well as by observation of the actual performance of the dam during high water.

The difference between the calculated and the observed discharges is due partly to the fact that a weir coefficient of 1.0 was used with the hydraulic tables. It was assumed that the discharge for the dam would be somewhat higher than this but the use of 1.0 would be on the safe side, *i.e.*, for a given discharge over the dam the elevation above the dam

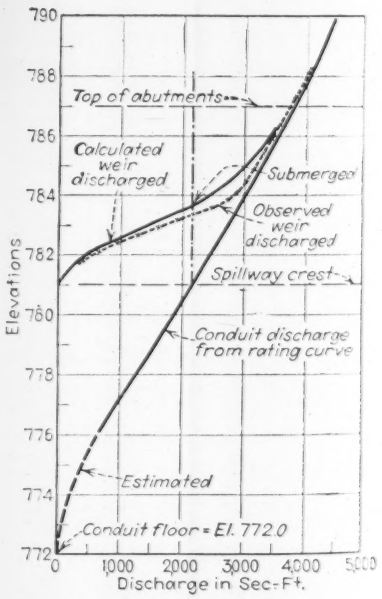


Fig. 4. Hydraulic characteristics that determined the design of the new submersible

would be less than calculated and the difference in level above and below the dam would be less than calculated. Another point of difference between the calculated and observed curves arises from the fact that the weir was considered to be submerged when the tailwater level reached El. 781, the crest of the dam. The observed curve does not change direction until the tailwater reaches El. 782, and therefore the dam does not act as a submerged weir until this elevation is reached. Presumably this is about the elevation of tailwater when the trough of the standing wave is at the same level as the top of the dam. The discharge per lineal foot of weir up to the level of submergence is about $3.9h^{3/2}$.

Concrete Blocks for Jetty Head

Army engineers plan to build concrete blocks within protection of rock barriers

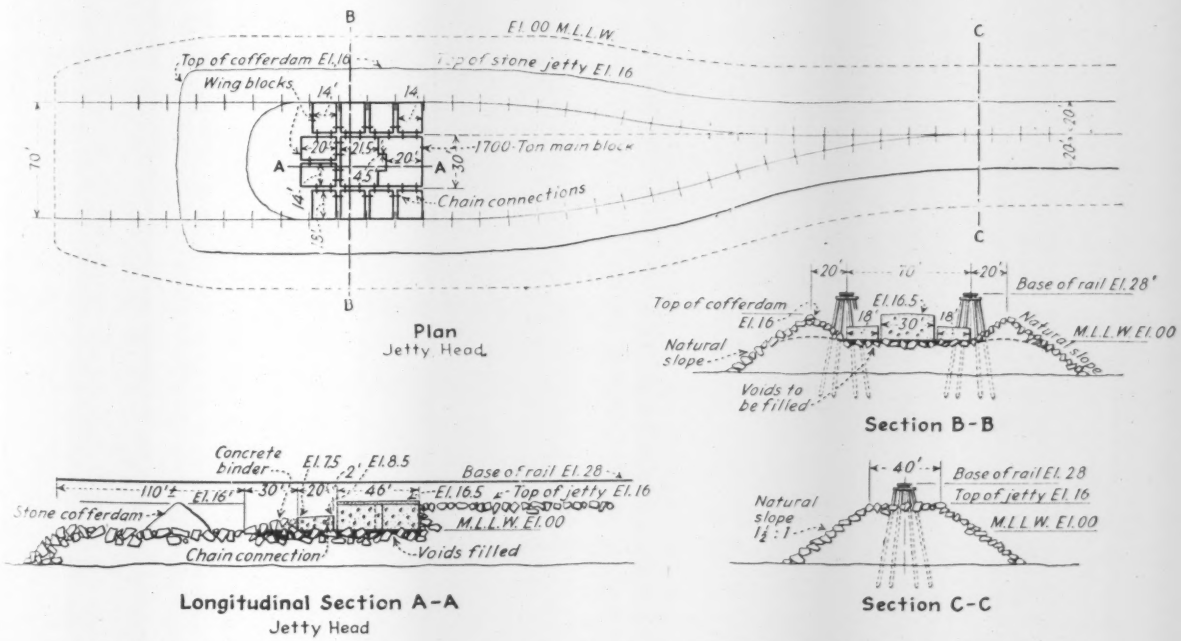
HEAVY, jetty-head construction of ingenious type is being planned by the U. S. Engineer Department for a structure that protects the entrance to the Umpqua River on the Oregon coast. Although actual pouring of concrete will not start until next summer, preliminary work has been done in the meantime so that the rockfill can settle through the winter and be ready next spring for construction to be carried on in the period of moderate wave action.

In general, the scheme is to build up a cofferdam on the outer end of the jetty consisting of a rock barrier behind which timber forms can be placed at mean lower low water; thus concrete can be poured in the dry, protected from even the moderate summer seas. Only the lower portion of the enrockment was placed before the coming of winter; thus there will be a compacted foundation structure on which to bring the cofferdam up to final grade after the winter storms and before concrete placing begins.

The concrete structure is to include a large main block flanked on three sides by wing blocks. The main block will be 30x46 ft. in plan and about 16 ft. deep. This will be poured in two sections with a heavily keyed vertical joint. With this design the plan is to begin pouring concrete in one of the sections just as the tide reaches lowest level and carry up the concrete level in that section fast enough to keep ahead of the rising tide. A total of about 1,700 tons of concrete will be included in the two parts of the main block.

On both sides and the outer end of the main block will be wing blocks weighing 160 to 170 tons. On each side will be four concrete blocks 14x18 ft. in plan and on the outer end two blocks each 14x20 ft. in plan. The wing blocks will be fastened together and to the main block by means of chains of wrought iron 2½ in. in diameter. It is expected that the blocks may settle and shift as the result of the battering of waves driven by winter storms, but the heavy chains are expected to hold them together.

The work is being one under the direction of the U. S. Engineer office, first Portland, Ore., district. Col. T. M. Robins is division engineer, Lieut. Col. Milo P. Fox is district engineer, and R. E. Hickson is principal engineer.



Proposed concrete terminal for south jetty head at the mouth of the Umpqua River on the Oregon coast.

FIG. 1. OVERLOADED SEWER DISCHARGING THROUGH ONE OF THE MANHOLES NEAR THE RIVER

Relief Sewer Ends River Pollution

by THOMAS A. BERRIGAN

Deputy Chief Engineer, Sewerage Division, Metropolitan District Commission, Boston

Construction features of a sewer designed to eliminate overloading of a system which disgorged through manholes and polluted the Aberjona River

SURCHARGED SEWERS in the Aberjona River valley of Massachusetts which had reached the stage of overflowing through manholes and backing up into residences, led to the construction of a $2,600,000 relief sewer recently completed. The new sewer involved interesting construction features such as the use of precast concrete pipe with special ends for rounding curves, and a tunnel section in which the invert was poured in place but the arch was formed with half sections of precast pipe.

Serving four towns (Stoneham, Woburn, Winchester, and Medford) in the Boston metropolitan district, the sewer is about 8½ miles in length and varies in size from a 3 ft. circular section to an 8.5 ft. semi-elliptical shape. It supplements existing sewers in the area, which had been designed in the 1880's and which had become woefully inadequate for the requirements of the present day.

Serious overloading found

Attention was directed to the sewer system in 1935 because of increasing pollution in the Aberjona River. An investigation revealed that the sewers in the valley were surcharged and in several instances overflowed through manholes directly into the river, as evidenced by Fig. 1, which shows a concrete trough provided to facilitate the run off.

In one dwelling it was discovered that the overloaded condition of the system caused basement fixtures to overflow into the cellar where sewage accumulated to a depth of 3 ft. In other cases, sewage was overflowing through manholes of local sewers into metropolitan district lines and was collected in the gutters of public streets and entering into catch basins provided for the purpose of facilitating surface drainage.

During the summer of 1936, when stream flow was low, ammoniacal-like odors emanated from the river during warm days. In the summer of 1937 this condition was accelerated and the river began bubbling with gas. At one place, where the river is shallow and a lake had been created with a low dam, the water surface was covered with a scum which was caused by gas-floated sludge deposits.

To obtain relief, it was necessary to treat the overflowing sewage with sodium nitrate, dose the lake with calcium hypochlorite, and to detail men to skimming the lake. The skimmings were dragged into a cove from which they were pumped into an excavation which retained the solids.

The investigation further disclosed that considerable ground and surface

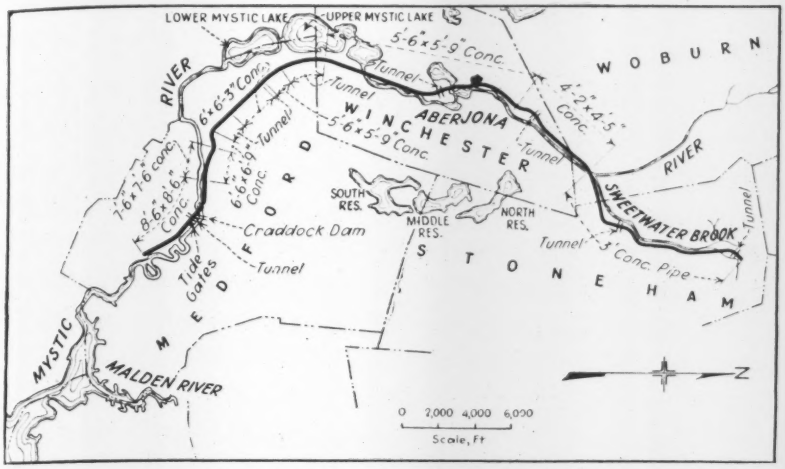


Fig. 2. General layout of the Aberjona relief sewer, Boston Metropolitan District.

Fig. 3. Tunnel construction showing the method of placing precast concrete pipe half sections on the invert which was poured in place.

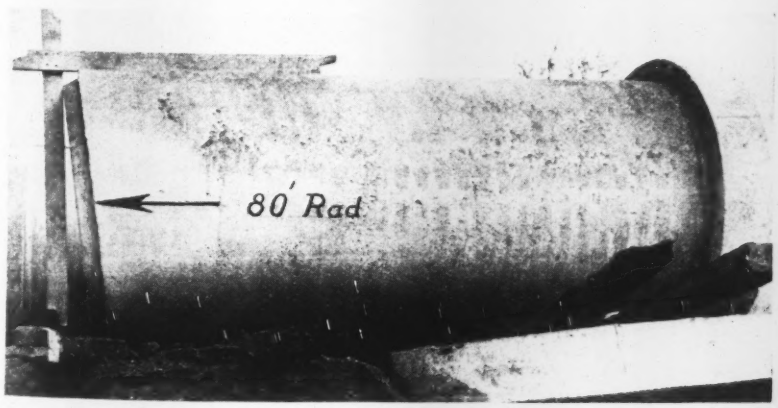


Fig. 4. Concrete pipe for curved section of line. The end is cast at an angle to fit an 8-ft. chord of an 80-ft radius. Note also the bell which is cast on the pipe to make a lap joint.

water entered the system as evidenced by the weakness of the sewage from some districts and the variance in the flow which appeared to be a function of the rainfall. The surcharged condition of the sewers made it an expensive matter to clean them, and the incrustation in certain relatively small lines in the upper portion of the valley substantially reduced their capacities. To aid in the elimination of infiltration, surface, and roof waters into the system, it was suggested that the districts be required to contribute to the maintenance of the system in proportion to their respective loads.

Under the present set-up a community contributes to construction of the system in proportion to its relative property valuation and for maintenance in proportion to its relative population. Also it became apparent that the effluent from certain industrial plants might be improved by stricter supervision respecting the cleaning of sedimentation basins and the introduction of flue gases for the purpose of facilitating precipitation.

While it was realized that a relief sewer would eventually be needed for the entire north metropolitan district, it was apparent that immediate steps should be taken in the Aberjona River valley portions of the system. To this end it was decided that about 8.5 mi. of sewer could be constructed, and provision made for overflow at the lower end where tidal water was available and where the quantity of diluting water was considerably greater than in the river above Craddock Dam.

While construction of the sewer with an overflow provided below Craddock Dam does not solve the future problem of providing complete relief in the metropolitan district, it does, however, constitute a portion of the work eventually required. Besides the present plan does eliminate widespread pollution in the upper stretches of the river, and confines pollution to a place where it can be controlled and where the detriment to public health is limited.

Basis of design

The sewer is designed to carry the domestic and industrial flow estimated for a population as of the year 1965. A friction factor of 0.015 in Ganguillet & Kutter's formula was used to determine the various sizes

of the sewer which were later modified. This modification consisted of reducing the velocity obtained by using the formula in accordance with certain factors obtained after experiments were conducted in the field for the purpose of finding the relationship between the theoretical and actual velocities.

This factor varied. Near the upper end of the valley and just below a point where industrial wastes were concentrated, it was 0.65, while further down the line at Craddock Dam, a factor of 0.75 was used. With this anticipated actual velocity of flow, the sewer was designed to have sufficient capacity to satisfy a load of 300 gallons per capita per day plus the anticipated industrial waste load.

The estimated industrial load was found to be about one-third of the domestic load so that the sewer has a capacity of about 400 gallons per capita per day on an estimated population as of the year 1965.

Construction methods

Most of the sewer was constructed by the open cut method. However, through certain principal streets and under buildings tunnels were required. The total length of tunnel operations amounted to about 5,040 ft. of which 1,400 ft. were constructed under compressed air through sand with a pressure not excessing 8 lb. Shields were used in three different tunnels, one of which was a compressed air operation.

The 6 ft. tunnels were constructed as shown in Fig. 3. The procedure followed in the free air operations was as follows:

Install liner plate ring the entire length of the tunnel and provide underdrain.

Pour concrete invert.

Grout outside of liner plates and underdrains by grouting nipples set just above springing line of arch and in the roof of the liner plates.

Set sections of centrifugally spun concrete pipe arch. (The pipe was delivered in 4-ft. sections, and the contractor was able to lay seven sections per day.)

Ram space between liner plates and concrete pipe arch with moist concrete, leaving a screed just above the arch. The screed was later removed thus leaving a void before the next piece of pipe arch would set.

Grout screed void every 40 ft.

Special pipe joints

On two sections of the open cut portion of the sewer a special type of reinforced concrete pipe was used. This pipe, spun by the centrifugal process, was built in sections 8 ft. long. In addition to the regular lap type of joint, a centrifugally spun collar was placed on the bell end of each pipe at the manufacturer's yard, and the pipe when delivered on the job was essentially a bell end pipe. The material used for caulking between the collar and the pipe at the factory was a mixture of 1 part cement to 3 parts brick sand.

The primary reason for using the special type of joint described was to ensure the absolute minimum of infiltration, as the entire flow of the sewer will eventually be pumped and treated. To ensure a tight joint on the field half of the collared joints, a mastic material was poured hot, using a snake to confine the mastic sealing material until it chilled and set.

For laying the sewer in curved portions of the line the pipe was cast with ends at an angle to the center axis. This made it possible to lay a relatively smooth curve, actually consisting of short tangent sections. A section of this pipe for use on curves is shown in Fig. 4.

Fay, Spofford & Thorndike of Boston were employed as consulting engineers on the project which was financed with a PWA loan and grant. The work was done under the direction of Joseph P. Dever, chief engineer of the sewerage division of the Metropolitan District Commission of Boston.

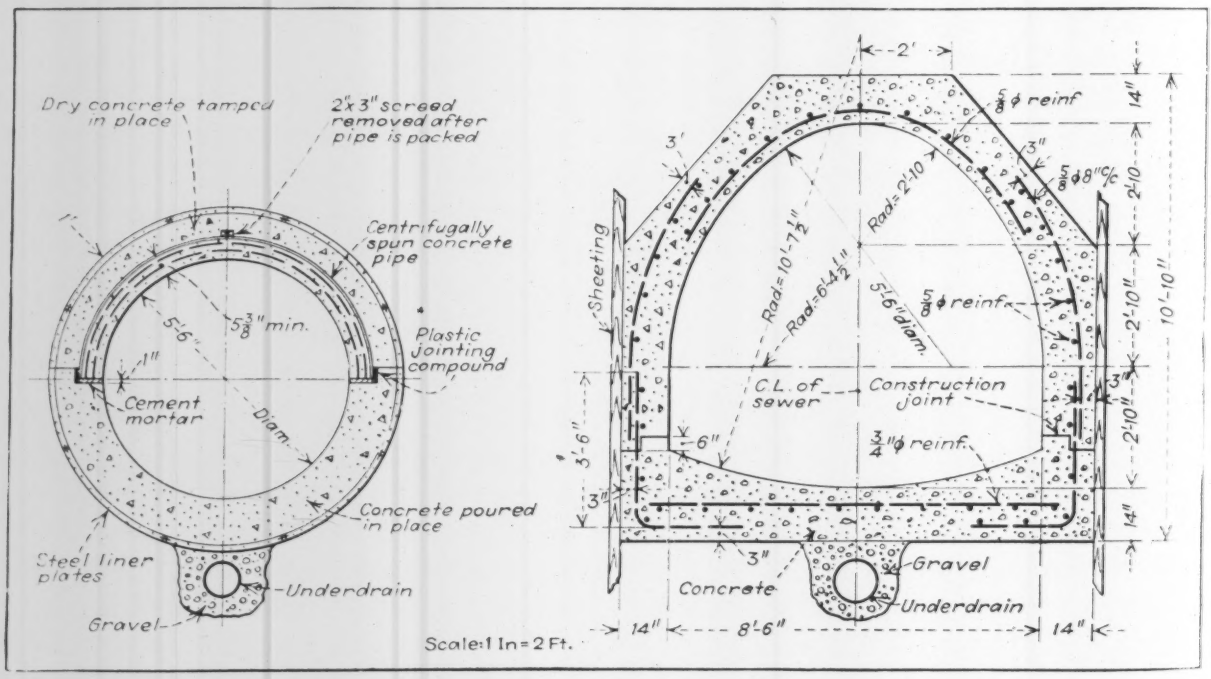


Fig. 5. Design details of typical sewer sections. (A) The tunnel portion; (B) the elliptical section.

Roadbuilding Surveys Its Field

Current practice in safety, financing and construction reviewed in over eighty technical reports at the ARBA convention

A NOTABLE NUMBER of papers and reports kept technical discussion apace with the great exhibition of roadbuilding materials and equipment held Jan. 17-21 at the Cleveland convention of the American Road Builders' Association. Following pages tell the story of the exhibits. Only brief statements are possible here of outstanding parts of the 85 papers read at the score of sessions. The general subjects covered were safety, road structure, stabilization, drainage, federal-aid distribution and planning.

Taking as his text the recent proposal of President Roosevelt that Congress should revoke the federal-aid authorization for the fiscal year 1938-1939 and place future authorizations more at the discretion of the President, Willard T. Chevalier, president of the association, vigorously combatted both changes in his opening address to the convention. Road transport, said Colonel Chevalier, never was more in need of liberal expenditure for highway improvement and no other national authorization and distribution of public works' aid was so free of political influence and personal prejudice as the present system of federal aid for roads. As to the claim of too-liberal federal aid, figures were quoted to show that in all the years of federal aid and for each recent year federal taxes on road users and motor vehicles had amounted to millions of dollars more than the federal funds expended in roadbuilding.

Taking for his subject an action program to advance safety on the highways, Thos. H. MacDonald, Chief U. S. Bureau of Public Roads, called attention to the formal survey made in 1937. A year ago, said Mr. MacDonald, Congress directed the Bureau of Public Roads to study the problem involved and to submit a report. Acting in cooperation with the Highway Research Board the bureau has produced a series of reports dealing with the following subjects: (1) Non-Uniformity of State Motor Vehicle Traffic Laws; (2) Skilled Investigation at the Scene of the Accident Needed to Develop Causes; (3) Inadequacy of State Motor Accident Reporting; (4) Official Inspection of Vehicles; (5) Case Histories of Fatal Highway Accidents, and (6) The Accident-prone Driver.

These reports have all been transmitted to Congress and are now in process of printing; they will be available for general distribution almost immediately. To carry into effect the existing knowledge in the field of accident prevention, the following eight-point program is submitted:

1. Uniform state motor vehicle traffic laws.
2. Skilled investigation of traffic accidents.
3. The establishment of a uniform system of accident reporting.
4. The establishment of an adequate highway patrol including the official inspection of vehicles.
5. The establishment of complete and final authority over the issuance and revocation of drivers' licenses.
6. A highway improvement program divided into two general classes of projects: (1) Those of the emergency type, and (2) those for the long-time plan.
7. A plan of state and federal safety organization adequate to secure on a wide scale the adoption and enforcement of the action program here proposed.
8. A national educational program.

Accidents and the road

Giving further evidence on Mr. MacDonald's sixth activity, the improvement of the road, three papers presented pertinent comment.

Comparative Figures—Figures collected by the National Safety Council show only four countries with a lower automobile death rate per 10,000 motor vehicles. Their combined registration is less than 7 per cent of that of the United States, while their ratios of motor vehicle registration to population range from ½ to 1/7 that of our own and the number of vehicles per mile of road is only from 1/2 to 1/5 as large as in this country. The automobile accident death rate in Germany is over four times that of the United States.

These examples are not quoted to minimize the seriousness of the traffic safety problem which faces us here, but to enable a somewhat calmer judgment to prevail in reviewing conditions as they actually exist. The estimated total of more than 39,000 fatalities in 1937 must also be viewed in the light of probably 240,000,000,000 vehicle miles of travel. The annual death toll mounts to a staggering total when viewed alone, but measured by miles traveled the situation is not hopeless.—C. H. PURCELL, *State Highway Engineer, Sacramento, Calif.*

The Road Factor—There is abundant evidence to demonstrate that highway design is one important causative factor in the national traffic accident experience. Although some degree of human failure is necessarily present even in accidents where faulty design is the controlling cause, evidence indicates that in the great percentage of such instances proper design would discount human failure by guarding the motorist or pedestrian from exposure to hazard. The highway is static, the human element and the vehicle are animate; consequently of the three the highway is most susceptible to control. The evidence indicates that the highway, properly designed and maintained, discounts for human or vehicular failure more readily than the individual or the vehicle can discount failure in highway design. Nothing in this statement, however, should be construed to minimize the need for more intelligent driving and walking and for continuing to build safer vehicles. Likewise, nothing should be taken to mean that proper engineering for motor traffic can dispense with enforcement and education.—H. F. HAMMOND, *National Conservation Bureau, New York, N. Y.*

Better Guard Rails—While the basic purpose of guard rails remains the same, in that it is their function to prevent the vehicle from leaving the road, increased speeds call for added functions. The problem now is not merely to prevent the vehicle from leaving the road in case it heads in that direction; it involves the further problem of deflecting the vehicle safely back on to the travelled roadway without injury to its occupants or serious damage to the vehicle.—O. F. GOETZ, *State Highway Engineer, Nashville, Tenn.*

Safety intersections

A symposium of opinion notable for its wide geographic coverage was presented by the committee on intersections and grade crossings headed by Robert B. Brooks, consulting engineer, St. Louis, Mo. The problem of common concern was the protection of road intersections. Individual statements of interest follow:

Arizona—Ample sight distance should be provided. Traffic entering a main artery from another highway should be fused into the line of traffic by the use of long-radius curves. Stop signs are recommended to stop traffic in the direction of the least important artery.

Illinois—In Illinois the safest highway intersection at grade on roads where traffic is reasonably heavy is the solid type, with extra traffic lanes extending from 200 to 500 ft. in each direction from the intersection and with 40- to 50-ft. radius turns at the intersection. Such a plan affords a better opportunity to control traffic by stop signs, flashlight signals or other devices. In open country where traffic is lighter, consideration can be given to longer-radius connections at the intersection.

Indiana—Highway intersections at grade should be designed to allow the greatest visibility possible. Landscape treatment of the approach should be so carried out as to inform the motorist that he is soon to come upon an intersection. In Indiana, during the last year the winking sign light showing a green light against a preferential road and amber against the secondary road has given very satisfactory results in slowing down the traffic and preventing accidents.

Iowa—The Cook County type and the wye type of intersection are both recommended, the choice depending upon the location and traffic. The wye open type of intersection is preferred.

New York—For main line and secondary highway at grade, it is recommended that the secondary highway be brought into the main highway at right angles; use warning and stop signs with reflector buttons.

Where a secondary highway intersects a main highway at an angle introduce transition lanes in the main highway if a major part of the traffic from the secondary road is in one direction.

Main highways should not intersect at grade. If for uncontrollable reasons they must, short interval stop and go lights are recommended as they are superior to any form of traffic circle or any other device regulating the flow of traffic.

Missouri—A safe highway intersection at grade on roads where the traffic is reasonably heavy is the type consisting of a widening on each side of the pavement for a distance of 200 to 500 ft. back of the intersection, the widening being connected by a curve of 40- to 50-ft. radius in each quadrant. The wye type of intersection, perhaps an improvement of the above type, lends itself to beautification treatment, and its use should be encouraged in locations where the terrain and property values permit. Stop signs and traffic-actuated stop and go signs should be used in conjunction with the above installations, in the rural and thickly populated areas, respectively.

Virginia—It is vital that adequate sight distance in all directions from the center of the intersection be provided; have found a form of intersection which provides safety islands before crossing the center point of the intersection works out very satisfactorily.

Ohio—The best design depends on the volume of traffic using the intersection and the equality of volume using the various routes. The traffic circle is fairly effective where large volumes of traffic enter the intersection from various roads or streets. Where the great volume of traffic is on one route, a traffic circle imposes an unnecessary hardship on the heavy-traffic road.

Hints on drainage

Half a score of papers on drainage practices in different sections indicated general adherence to conventional methods both for waterways and for surface and underdrainage, with special practices to meet regional differences of topography and runoff. Some of these practices were:

Road Dips—In Arizona many an insignificant-looking dry wash becomes a roaring torrent once every year or two. In these cases a road-dip or overflow section is the economical drainage device for low-traffic roads; they are seldom used on primary roads. Dip grades are now kept to 2 per cent or less and vertical curves are not less than 200 ft. to ensure easy riding at present higher speeds. Low cost is the main reason for the use of dips.—E. V. Miller, *Engineer of Plans, Arizona Highway Department, Phoenix, Ariz.*

Selfdraining Bases—Roadside ditches are not used in Massachusetts; every road except in sand or gravel country is built on a foundation of gravel. This varies in thickness with the type of natural road-bed material but averages about 12 in. The gravel foundation must be drained so it will only form a reservoir for water at low points. The subgrade under the foundation is crowned, parallel to the crown of the surface. In full sections the gravel layer is carrier through the shoulder to the slope to allow the water to leach away and in addition, bleeders consisting of trenches filled with screened gravel stone, broken stone or sledged stone are constructed through the shoulders to the slope at all low points and at frequent intervals wherever there is an opportunity to outlet the water. Wherever catchbasins and drains are constructed to take care of surface water, water from the foundation is led into the catchbasins through openings in the catchbasin walls.

The disposal of surface water is as carefully studied and is as integral a part of the design as the line and grade of the highway. Rather than ditches or gutters to carry the water comparatively long distances in a haphazard manner, on nearly every highway complete drainage systems consisting of catchbasins connected by stubs to a main drain are provided. The water is confined to the highway by curbs or low hardened berms at the edge of the shoulders and is picked up by catchbasins at sufficiently frequent intervals that at no place is the flow enough to require anything like a definite gutter or ditch.—P. H. Kitfield, *Assistant Project Engineer, Massachusetts Department of Public Works, Boston, Mass.*

Ditches Ineffective—Roadside ditches, to a certain extent, lower the ground water level. Their effectiveness is dependent upon their depth and nearness to the center line of the pavement. The high speed traffic, as a matter of safety, has forced the ditches farther back and reduced their depth to a point where their usefulness is almost negligible as a means of lowering the height of the water table.—R. B. Traver, *Superintendent of Highways, Onondaga County, Syracuse, N. Y.*

Soils Profiles—Representative samples are obtained of each type of soil below the proposed grade for a total depth of from 3 to 4 ft. The laboratory classifies these samples according to the Bureau of Public Roads' classification, and graphically presents them to the designing engineer in what is known as a "soils profile."

The report on the test of these samples by the laboratory tells the designing engineer when drains are considered necessary and the type, depth, and spacing for the most satisfactory results. It may also indicate the desirability of insulation courses including the type, depth, etc.—George J. Thormyer, *Engineer, Ohio Department of Highways, Columbus, Ohio.*

Desert Roads—The California division of highways has developed a protection for desert roads which has proven effective in reducing the storm damage. The

method consists of constructing drainage systems of wide and deep channels with protecting dykes, converging toward or parallel to the line of the highway depending upon topography. These protections are some distance from the road. These channels intersect the flow and divert or direct the flood waters into main channel openings of the highway structure or to grade dips. The latter are constructed in lieu of structures when topography limits available headroom or until permanent waterways are defined. This method of controlling the flood waters of desert storms has proven so successful that damage to the roadbed has been reduced to a negligible amount.—F. J. GRUMM, *Engineer of Surveys and Plans, California Department of Public Works, Sacramento, Calif.*

Curve Drainage—In Michigan a design policy recently established provides for roll curb on the inside edge of pavements around superelevated curves wherever shoulder erosion is apt to occur. The water collecting in this curb is led either to the adjacent ditch by an outlet spillway across the shoulder or dropped through an inlet into a sewer provided for this purpose. Where conditions exist which do not warrant this procedure the inside shoulder on all superelevated curves is gravelled or bitumen treated to prevent erosion.

Ditches on the outside of superelevated curves are given a depth below the superelevated shoulder consistent with the depth required elsewhere below the grade line under similar conditions. However, independent ditch grades are used to overcome the effect of superelevation when it tends to disturb the normal gradient. J. G. SCHAUB, *State Highway Department, Lansing, Mich.*

Looking ahead in structures

Among the papers on roadway structure and structures, interest centered in a number looking forward to types that the future promises to bring. Two of these were flying or flight strips for main highways and elevated highways for city access and through roads.

As defined by Lt-Col. S. S. Hanks, Air Reserves, New York, N. Y., a flight strip is an area not less than 200 ft. wide and 1,500 ft. long located adjacent to a public highway and is a part of the highway right of way. If flight strips are to be made a part of the state highway programs, so this new phase of highway development will be placed directly in the state highway departments, said Col. Hanks, new legislation may be needed in many of the states. In states which require additional legislation, such laws should show that state highway departments are best qualified of all state agencies to maintain flight strips. This is because the state highway departments, while working on the highways, can use their trained personnel and equipment to maintain and to develop areas for flight strips adjacent to the highways. A copy of a proposed uniform flight strip act is in the hands of the governors of the 48 states, and many of them have refered this act to the proper department of the state government.

In its report the committee on elevated highways headed by V. G. Iden, Secretary, American Institute of Steel Construction, Inc., New York, N. Y., pointed out that roadbuilders are today, as never before, confronted with the problem of tapping and draining the city streets, so that automobiles may obtain easy access to the city centers.

Expensive street widening

Many streets are being widened at great cost to the city and loss to the property owners. While these improvements seem to increase the flow of traffic through such highways, that flow is not increased in mathematical proportion to the width added. Bypass roads have failed permanently to solve the traffic problem because business has a habit of moving out to the improved highway. Furthermore, bypass roads do not serve the congested center, but are frankly designed to avoid the congested center.

The conditions indicate beyond a doubt that the greatest need of the age is express highways that will serve the congested centers. They can be provided. Elevated highways affording all the limited features necessary to cope with the problem, and accommodating swiftly moving through traffic, are possible.

According to present practice, elevated highways should clear the underlying streets by at least 15 ft., thereby leaving the surface roads free for truck and load traffic. The elevated road should have traffic lanes at least 10 ft. wide, and 11 ft. wide would be better if the street will accommodate it. An 11-ft. lane should be the minimum requirement on curves, at least. On elevated roads which carry passing lanes of traffic there should be a physical separation of traffic coming in opposite directions, and the road should provide for accelerating and decelerating lanes better to accommodate the traffic entering or leaving such highways. The design should take into consideration the movement of traffic underneath and the types of ramps to and from the elevated highway above, the banking of curves, location of ramps, methods of snow removal and prevention of the formation of ice.

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Building Design Control Successful in San Diego

ARCHITECTURAL control by municipal ordinance is proving both satisfactory and popular in San Diego as a means of preserving good exterior building design. When the ordinance was passed three years ago, as an amendment to the building code, only part of the city fronting the principal highway was affected. Since then, according to the American Society of Planning Officials, four additional areas have been added, mainly on petition of property owners and petitions are now being circulated to bring over 5,000 acres more under the same control.

The municipal ruling requires that all applications for building permits, plans, and specifications for buildings within the prescribed areas be referred by the Building Inspector to the City Planning Commission for approval as to the exterior design. If the design is approved, the building permit is issued. If it is not approved, the City Planning Commission confers with the applicant and recommends needed changes.

Voluntary control best

Cities which have made large investments in civic centers, construction of other important public buildings or in park sites frequently want to provide some method to prevent erection of ugly and inappropriate structures around such developments, points out the American Society of Planning Officials. Most municipal officials do not favor compulsory control. Voluntary control instigated by property owners themselves, as in San Diego, is regarded, therefore, as a possible solution to the problem.

Equipment Passes in Review

by H. W. RICHARDSON
Associate Editor, Engineering News-Record

Trend and progress of construction machinery, tools and materials graphically portrayed at ten million dollar display at the 1938 Road Show at Cleveland

IT WAS A GREAT SHOW—a brilliant display of construction equipment. In many respects the 1938 Road Show of the American Road Builders Association, held in Cleveland's huge public auditorium Jan. 17-21, was the greatest and most successful of all. Registration of visitors exceeded 25,000, a new record. Floor space covered by exhibits was 50 per cent more than the successful show in the same halls two years ago, while the number of machines displayed was almost three times as large. Equipment jammed every booth to capacity; aisles and passageways lost their identity as units of the various manufacturers crowded each other and occasionally overlapped on the floor. In number of exhibitors the 1938 display did not come up to that of the 1930 Atlantic City show—but there are not as many firms in the business today as exhibited at that show. However, the value of equipment shown this year topped $10,000,000, displayed by 225 manufacturers.

For the first time since Atlantic City, mixers and pavers were shown, which, along with a full return of power shovels to the fold, marked the first good old-fashioned Road Show in eight years. Many of the shovel people came back two years ago, but with only a few machines as compared with this year's display. And when the mixer makers did return they came back with a bang—monster double-drum pavers, a 40-E single drum unit, a tower on a standard 27-E paver and a whole flock of smaller mixers down to 3½-S sizes, impressed visitors with the importance of concrete in roadbuilding and construction.

The shovel people should be justly proud of their efforts of the past year or so, for the sleek, trim units that simply exude power are a joy to behold.

Bituminous equipment manufacturers are right up in front also, with new and efficient rigs for every type of blacktop work. Graders and scrapers were a revelation in smooth design and workability—Zephyrs and Streamliners in place of the plodding, clumsy switch engines of only a few years ago. And so it was all through the acres of exhibits—new, sleek machines of beauty and utility that forecast a new era of construction technique.

However, the equipment progress was only a part of the success of the show; the enthusiasm, optimism and confidence expressed by the manufacturers and shared by the visitors made this show the greatest of all. Sales on the floor exceeded $4,000,000, topping by far all previous records, and the interest—real buying interest—shown by the visitors warmed the hearts of the manufacturers and swept away all the misgivings of only a few weeks ago. Those who supply the physical needs of construction are confident of the future.

The following description of all machines and materials on display, compiled from a personal survey and classified for ready reference with a directory and cross-reference of manufacturers at the end, portrays the trend and advances in all lines. As pointed out in our issue of Jan. 13, the general trend is toward better engineering design, use of better materials and alloys, welded fabrication, diesel power, faster and easier operation, adaptibility to wider range of use, and to more precise operations.

Excavators and Loaders

WELDED TUBULAR and box booms are a modern feature of power shovels, and diesel power is almost universal. Scrapers are all-welded, their operation, whether by cable or hydraulic jacks, is simpler and easier controlled than previously. Graders are real utility rigs, sleek and smooth, designed for today's precise grading requirements.

1. Crawler Shovels and Cranes:

Lima again showed the biggest shovel on the floor, its 2½-yd. improved Model 1001 powered by a Waukesha Hesselman oil engine. It weighs 90 tons, travels on 30-in. treads (can be fitted with 44-in.) which are extensible for dragline and crane work. An all-welded box boom gives it a sleek appearance, and Bendix vacuum control makes it easy to operate. All operations, including the live boom, are independent.

Northwest displayed three rigs, all with smooth-welded cocked booms that set them apart. A new rig is the Model 25 Pull-shovel, a ¾-yd. machine with an arched boom for closer haul of the dipper. Live rollers, real adjustable hooked rollers and welded side frames are a feature. This same unit was shown as a ¾-yd. shovel, gas powered, with a single dipper stick and bucket integral with the stick. The Model 70 shovel, 1¾-yd. capacity, completed the Northwest display. This rig is powered by a Northwest oil engine, has a deep welded box boom with two outside dipper sticks, and uses the Northwest rope crowd which utilizes the cable pull as a crowding aid, a feature of all shovels of this firm.

Harnischfeger boasts it has the "Five Years Ahead" shovel in the new P&H ¾-yd. unit, equipped with chain crowd, welded box boom and two dipper sticks, welded alloy dipper, live and hooked rollers and a Waukesha gas engine. The boom and most structural parts are also welded alloy steel, claimed to provide unusual strength with light weight.

Koehring's idea of the modern shovel is portaryed in the new Model 603, 1½-yd., and Model 303, ¾-yd. The larger rig has a streamlined bucket, all-welded single box boom and two outside dipper sticks, is vacuum controlled and is driven by a Wisconsin gas engine. Single chain crowds are a Koehring feature. High spots of the smaller rig are combined hooked and bearing rollers, all-welded crawler frame—trim and neat—all-welded live box boom and outside dipper sticks, two-speed swing, an 83-h.p. engine giving a line speed of 180 ft. per min., and interchangeable clutches. This rig was mounted on a new six-wheel transport trailer.

Four machines filled the Thew space. One is brand new, the Lorain 40 trench hoe, ¾-yd. size, fitted with a regular shovel boom, extra wide treads, and a Caterpillar diesel engine. To convert this rig from shovel to backhoe the shipper shaft is dropped, a tubular torsion member is slipped into the upper part of the boom and the hoe arm and bucket are pinned

to the boom end. The boom is welded and riveted, with pressed steel sideplates. Towering over the whole show was the Thew Lorain 75 dragline carrying a 2½-yd. bucket at the end of a 50-ft. crane boom. It is powered by a Waukesha Hesselman oil engine and moves on 33-in. crawlers. The Lorain 77, a 1½-yd. shovel, diesel powered, with tubular shipper shafts and short tubular torsion member in the lower end of the boom, was also on display. A little ½-yd. shovel with tubular dipper stick and combination rope and rack crowd, snuggled under the huge dragline like a chick under a hen.

Marion is featuring its new ¾-yd. Model 331 shovel, Buda gas powered, chain crowd and fitted with a trim-looking U-beam welded boom. Self-cleaning, nonbinding crawlers, manganese steel front dipper, and full welded construction are talking points. One of the new line of larger shovels, a 2-yd. rig, was also shown. This line has welded box booms, longer and wider crawlers, live rollers, large diameter rotating clutches and independent chain crowds.

Osgood has come out with a new ⅜-yd. Invader, a true crawler shovel of small but husky proportions, for this little rig weighs 12 tons. It is gas powered, has a single U-beam dipper stick inside of a welded box boom, boasts a full cab and a chain crowd. Looming above the small rig was a 1½-yd. Osgood diesel shovel with an improved truck frame and chain crowd. This big brute weighs 99,160 lb. Off to one side but attracting more than its share of attention was a spanking new General ½-yd. gas shovel boasting several grown-up features, such as chain crowd, all-welded boom, independent operating and steering mechanisms and double-disc drive clutches. It has a low bed frame with the circle cast with the bed.

Through the Speed-O-Matic hydraulic control operating system, Link-Belt contends the big 2-yd. shovel on display is as easy to operate as an automobile. We'll have to take their word for it, but at any rate it is a neat but powerful-looking rig, with Waukesha Hesselman oil power, welded box boom and two outside dipper sticks and a chain crowd.

Bucyrus-Erie showed its popular little ⅜-yd. full-revolving Model 10-B, claimed to be today's best seller. Alloy steels make it a fast, light rig that can step right out 4.5 m.p.h. Alongside was a 33-B diesel, a 1¼-yd. shovel with deep box boom and chain crowd. Light, welded alloy fabrication from the boom base outward has reduced the counterweight at the other end. Stretching out over the other rigs was a 19-B crane, convertible to a ⅝-yd. shovel. Its tail has been cut short for swinging in tight places, a feature of all B-E machines.

Bay City Shovels is right in the backhoe swim with a ¾-yd. heavy duty Model 15 rig that sports a welded double boom and diesel power by Hercules. Attention was focused on the new Model 25 shovel, ½-yd. size, gas powered and chain crowd, fitted with two dipper sticks straddling a welded box boom. This little giant registers 25,000 lb. on the scales and wanders around on 16-in. crawlers. Its bigger brother, the Model 32 diesel ⅝-yd. shovel was doing duty on the International Highway.

Speeder steps out with a ¾-yd. crawler diesel shovel, with two outside tubular sticks on a welded box boom. Just to me different it uses a combination rope and chain crowd. Its baby brother, a ⅜-yd. crawler shovel, has a rope crowd, stainless steel tubular dipper stick inside a box boom, and was mounted on a trailer.

Byers likes them small and medium, so starts out with a new ½-yd. Model 62 shovel, cable crowd, single dipper stick on a bolted frame boom (a novelty at this show) and Buda gas powered. Alongside was a Bearcat Junior three-quarter swing ⅜-yd. shovel, cable crowd, open cab, gas powered, mounted on a transport trailer. Lording over these two was a ¾-yd. Model 83 shovel, boasting an ultra streamlined cab, chain crowd, welded box boom and two outside dipper sticks—gas powered it is.

More small shovels on crawlers: Insley showed a ⅜-yd. full revolving shovel, sleek looking with outside tubular dipper sticks on a welded box boom, chain crowd, designed for fast operation. A model of the Insley Hill-Billy, a crawler backhoe that accommodates itself to tilting terrain, created lots of interest. Universal's entry was a ⅝-yd. full revolving shovel, chain crowd, sticking to the conventional framed boom. Hanson was well satisfied with a lone ½-yd. crawler shovel with reinforced dipper stick and chain crowd—it's claimed to be a fast operator. The Buckeye Clipper is a small but trim ½-yd. rig with grown-up ideas, such as streamlined cab, combined hook and bearing rollers, chain crowd, semi-box welded boom and "Mevac" vacuum control for independent operation.

2. *Truck and Tractor Shovels:*

Speeder hangs a ⅜-yd. shovel on a Caterpillar D-6 tractor. It has a tubular stick, rope crowd and rear hooked rollers. This was the only dipper type shovel on the floor not mounted on crawlers.

Michigan Power Shovel was showing a new truck crane, a husky model with a 25-ft. boom, convertible to a ½-yd. truck shovel. Michigan makes its own trucks for these rigs, and dispenses with the truck cab, but puts a neat streamlined cab on the crane. Combination hook and bearing rollers, adjustable for wear through cams, and air control are features. The welded truss boom was carrying a half-yard Blaw-Knox clam-shell bucket.

Trackson showed two of its Pipelayer side-mounted cranes, one on a Caterpillar D4 diesel tractor, the other on an International tractor. The power winches are mounted on the opposite side from the A-frame boom. Trackson also displayed a High Shovel, a ¾-yd. front scoop rig cable operated, mounted on a Caterpillar D4 diesel tractor.

The front scoop tractor shovels seemed to be popular this year. Tractor Shovels had one on a Cletrac diesel tractor, a ½-yd. size. This rig departs from the conventional in that it throws clear over the tractor to unload. Hough uses hydraulic operation on its ½-yd. shovel, mounted on an IHC wheeled tractor.

3. *Carrying Scrapers:*

Carrying scrapers were out in full force—large, small, cable and hydraulic operated, front dump, back dump, push-out dump—anything the dirtmover desires. Austin-Western likes both types of control, for it showed a 12-yd. hydraulic controlled scraper on six pneumatic tires, and a 5-yd. all-welded sinble-cable controlled model on four wheels. Killefer goes in for the little fellows, displaying a 2-yd. rotary scraper that boasts manually-controlled cutting depth and spreading thickness.

LeTourneau long ago started all this carrying scraper business, and was right on hand with two models—both cable controlled, of course, if you know LeTourneau. One was a husky 12-yd. pushout type, framed with all-welded box members, mounted on four 18x24-in. Firestones and hitched to a Caterpillar D8 diesel. New to LeTourneau was a 6-yd. pushout front unloader which accommodatingly spreads its own load, carried by four dual wheels fitted with 7.5x20 Goodrich tires.

LaPlant-Choate tells you they have the answer to all scraper problems. They are enthusiastic about the Carrimore dump type rigs, of which the 6-yd. size was shown. It has a bell bowl for scientific

AT WORK . . .

loading, one hydraulic jack for all operations, which calls for automatic closing front and rear gates, and is carried on two 13.5x20-in. tires. Dwarfing this model was a 15-yd. pushout type Carrimore scraper, also controlled by a single hydraulic jack and fitted with a bell bowl. It takes six 18-in. tires for this rig. Features common to both types include serrated reversible cutting edge, down-pressure digging, and valves mounted on the scraper, requiring only a Bendix cable control on the tractor to actuate the valves.

Continental's biggest entry was a 12-yd. wagon scraper which digs, loads, carries and spreads, all through cable control by means of a tractor winch. It is framed with all-welded members. A 7-yd. model, combination hydraulic and cable control was mounted on Trackson crawler wheels and a 5-yd Junior model was mounted on rubber, also combination hydraulic and cable controlled. Deep digging, full loading, fast dumping, simple backfilling and short turnin are Continental's talking points.

Heil showed two sizes of its Dig-N-Carry scrapers, clean-cut welded-frame rigs of striking appearance. The larger is a 12-yd. rig, hydraulic control with the tanks and piping in a hollow box frame, good for a 6-in. cut or 12-in. spread, both depth and thickness at the will of the operator. It is mounted on two dual rear and two single front wheels. An exclusive feature is a dial that registers the depth of cut or thickness of spread in full view of the operator. A 5-yd. smaller model is an exact duplicate of the larger rig except for size.

Emsco uses a simplified cable control on its neat 10-yd. carrying scraper of all-welded construction. It takes four rear and two front tires to carry this rig. The Emsco cable winch does the controlling.

Gar Wood, of boating fame, also builds carrying scrapers of welded frames, hydraulic control, front dump type. A 12-yd. model was mounted on six 13.5x20-in. tires, while the smaller 8-yd. rig needs only four such tires.

Baker has a new model 5-yd. hydraulic scraper of all high-tensile steel construction, rear dump type. The rig acts as an automatic strikeoff when dumping.

From the far away shores of the Pacific a working model of a cable controlled carrying type scraper was sent by Southwest Engineering Works. The model worked perfectly, but we can't tell you much about the actual machine.

4. Bulldozers, Trailbuilders:

Baker likes the vertical lift arrangement in hydraulic control of bulldozers and gradebuilders, and displayed two of its machines so equipped. A new gradebuilder is made entirely of high tensile steel and has telescoping side arms for changing the angle of the blade. The vertical lift arrangement employs a heavy inverted U-frame actuated by two vertical jacks. Baker also showed its standard bulldozer; both rigs were mounted on Allis Chalmers tractors.

Emsco exhibited both a trailbuilder and a bulldozer, all cable-controlled and mounted on an Allis Chalmers and Cletrac respectively. The trail-builder is fitted with spring-mounted sheaves that reduce cable wear considerably.

Hough hangs a backfiller blade on an A-C tractor in the same manner as its tractor shovel. It is combination cable and hydraulic controlled.

LeTourneau, to whom cable control is everything, showed a U-frame saddle type angle dozer on a Caterpillar D7 diesel tractor, with a two-drum power hoist thrown in for good measure. A husky LeTourneau bulldozer was hung on the front of a D8 Cat diesel, its cable hoist being powered by a front power takeoff, for a Hyster towing winch was fastened to the rear end of the tractor.

LaPlante-Choate displayed its hydraulic bulldozer on a Cat D6 diesel and a hydraulic trailbuilder on a D7 tractor, the last also carrying a Hyster cable winch. Tractor Shovel included a cable-operated bulldozer, capable of exerting down pressure, by the way, on the same Cletrac that carried its tractor shovel. Trackson showed a cable-operated bulldozer mounted on the same kind of frame that carries its front shovel, two of these rigs being displayed on IHC tractors, one included with the Pipelayer crane. A Gar Wood hydraulic trailbuilder was set on a 60-hp. Cletrac.

5. Graders, Planers, Rooters:

Some of the most interesting and greatest improved equipment on the floor is included in this classification. Most of the graders were sleek-looking rigs, with all-welded tubular or box backbones.

A high spot in grader development is the new Austin-Western Model 99, which steers and drives from all four wheels—dual tired wheels, by the way. This is a motor patrol grader, diesel-powered and fitted with a comfortable cab. It carries a 13-ft. blade adjustable to any grading position. Front and rear wheels can be steered independently or together, permitting side shifting, short turning or conventional steering, like an aerial fire truck. The frame is a stabilized design. The 110 Austin-Western drawn grader, all hydraulic control, mounted on four pneumatic tires, was also shown; in fact, two of these machines were present, one doing the steep bank grading on the International highway. It carries a 10-ft. blade hanging from a welded box girder backbone.

Galion has developed a clever circular ring arrangement of interlocking hydraulic jacks, all moving around a welded beam backbone, on its No. 120 drawn grader. The rig carries a 12-ft. blade that can be adjusted to any position from flat grading to cloud scraping. The husky Galion Motor Grader, IHC diesel-powered, was also shown, featuring hydraulic controls, leaning wheels, and a heated cab.

Caterpillar showed its new No. 10 Auto Patrol grader, diesel drive, single low-pressure tire mounted and mechanically controlled. It is built with an open frame. Other Caterpillar graders included the larger No. 11 Auto Patrol with dual tandem drive, diesel powered, box frame, leaning front wheels, with 12-ft. blade and scarifier, all mechanically controlled; also the No. 66 gas power controlled drawn grader on a single box welded frame, carried by four pneumatic tires.

Allis Chalmers made quite a display of its new No. 112 drawn grader, mounting it on high supports so it could be put through its paces to the spiel of a loud speaker. This is a neat trim rig, with a tubular main frame and tubular circle frame. It is hydraulic controlled, has a leaning frame on four rubber tires and sports a 12-ft. blade. Its low draft point is a ball-and-socket connection. A companion to the No. 112 is the No. 110, identical except smaller and carrying a 10-ft. blade. There was also the No. 42 Speed Patrol gas engine tandem drive grader in the A-C booth, having a leaning frame carried on six tires, carrying both a scarifier and blade. Another model, the K-054 diesel powered Speed Patrol grader, with enclosed cab, carried a Baker V and wing snow plow, which, with its scarifier, made it ready for snow, dirt or what have you.

Sleek is the only term for describing the new Riddell Ranger drawn grader, with its slender tubular main frame and tubular circle frame. It is a leaning wheel type on four rubber tires, hydraulic controlled with a 12-ft. blade. The old reliable Model H center control Warco Roadhog motor patrol with its curious Octopus tandem eight-wheel drive was on display. This is a manual control rig, carrying a scarifier and a 12-ft. blade. The four-wheel drive Warco Roadhog was also shown by Riddell, with its power control for the 12-ft. blade and scarifier.

Adams showed its full line of heavy duty graders for building the road "from ditch to ditch." New was the No. 20 Motor Grader, gas powered, with a 10-ft. blade and scarifier, manually controlled and without a cab. Also shown was the Adams diesel Motor Grader, tandem drive, with an all-welder box girder gooseneck frame, carrying a 12-ft. blade hydraulic controlled. Then, of course, was included the old standard Adams leaning wheel pulled grader, hydraulic controlled and with a box welded frame on four rubber itres.

Huber showed the Superior No. 4 Motor Patrol, full hydraulic operated, with the power unit in front and controlled and driven from the rear through dual pneumatics.

St. Paul Hydraulic Hoist and Root Spring Scraper Co. both showed maintainer blades on dump trucks.

Gledhill has improved the well-known Road Shaper, a drawn rig with multiple blades, hanging on a combined wheel and sled frame, for cutting and trimming the roadway and spreading materials. Heltzel provides the means for subgrade trimming with the Trail Grader, adjustable from 10 to 12 ft. in width.

Road rippers and rooters were prominent. LeTourneau showed a big brute—cable controlled, of course—a three-toothed affair that will tear up anything that it can get its teeth into. Emsco also has a cable-lifted heavy duty ripper. Baker combines a road ripper with a scarifier. Jaeger calls its rig of this type a road ripper and grade rooter.

Killefer will rip up easy or tough surfaces with its manual controlled wheel lift road ripper or with the heavy duty rollover self-cleaning ripper, manually controlled on two steel wheels. Killefer also

shaves and planes the surface with a Road Planer, a series of discs spaced close together in staggered sets, or with the heavy tandem Road Disc, 10 ft. wide.

6. Excavators and Loaders:

Haiss showed the Model 135 bucket excavator and loader, crawler mounted, and the new Model 75 chain bucket loader, also on crawlers. White puts a half-yard front loader on a Case wheeled tractor, the bucket is cable controlled. Cletrac fitted up one of its BD 36-hp. diesels with a ¾-yd. front loader, hydraulic operated.

Caterpillar displayed the only elevating grader on the floor, a 42-in. size, powered with a Cat diesel engine. A light type portable chain bucket material loader, on pneumatic tires, was shown by Jeffrey.

Buckeye Traction Ditcher meets a crying need with a new type of highway widener excavator, available in two models. The smaller one was shown, mounted on a Chevrolet truck. It is a ditcher type rotating excavator, mounted on the side of the truck and receiving its power through a takeoff from the truck engine. This model digs a trench up to 27 in. wide, throwing the excavated material off to the side by a short belt conveyor. Buckeye also showed the No. 120 Traction Ditcher, for small water and sewer pipe work. It has a new style tubular boom on the ladder frame, cuts a trench up to 11½ ft. deep and 30 in. wide.

7. Buckets:

Excavating and material handling buckets of all types were out in full force. The newest thing in buckets is a combination orange peel and rock grapple, just brought out by Owen. It is a four-jaw affair, the jaws being hinged in a manner that permits the one meeting the least resistance to dig in and take hold first, followed by the other three. It looks good. Owen also showed a brand new type of round nose or round bottom (depending upon your anatomical viewpoint) clamshell that digs right in and keeps going for a full load. A new Type S light-weight material handling clamshell of alloy steels completed the Owen display.

Haiss has streamlined his buckets and has done some dental work on the teeth for better biting and digging. The ⅜-yd., ½-yd. and 1¼-yd. sizes were on tap.

Wellman had a line of Williams buckets scattered over quite an area, including the 1-yd. dragline, ¾-yd. lever arm general purpose clamshell, ditto multiple rope style, ⅜-yd. excavator clamshell and a sprawling 1½-yd material handler.

Bucyrus-Erie showed a 1¼-yd. Red Arch dragline bucket, and Bay City countered with a ½-yd. size in fighting trim. Blaw-Knox wound up the bucket display with ½-yd. and ¾-yd. digging clamshells.

8. Snowplows:

Let it snow! There were enough plows on the floor to clear all the roads this side of the North Pole. Baker showed a front V and wing blade on an A-C tractor, and repeated with the same display on an A-C Motor Patrol grader. And the array of Baker unmounted V, wing and blade plows covered an acre or so.

Klauer takes snow removal seriously, and has redesigned the famous Snogo, a rotary type with blower disposal that will bury the nearby farmhouses with the flying flakes. It is mounted on an International truck, is powered by a separate Waukesha unit on the rear of the truck, and cuts a swath 8 ft. 3 in. wide. The cutters and snow throw are hydraulic controlled. A Snogo rotary plow and truck loader for city work, Climax powered, was also shown.

Good Roads had a flock of plows on hand, both mounted and unmounted. Those looking for a snowstorm were mounted on Case wheeled tractors—a Champion V, hydraulic controlled, hanging on the front end of a 40-hp. high speed tractor; a Sidewalk plow, also hydraulic controlled, with a disc cutter and trimmer at one end of the blade and a single wheel of its own for careful gaging of the cut, was on a 15-hp. tractor. Two V and four blade plows, unmounted, were ready for a tractor or truck.

Walter buries the entire front end of its 7-ton truck with a monster of a V plow, and then hangs a wide wing blade on the side—the whole constitutes the Walter Snowfighter. Looks like the snow hasn't a chance against this outfit.

Ross showed a front and wing plow on an International truck and a light snow blade on an IHC wheeled tractor.

Haulage Units and Rollers

THE WAGON TYPE haulage unit for large dirt loads is as popular as ever, and is for the greater part on rubber. Trucks are now designed for construction use. Rollers have all been equipped with the third smoothing roll.

9. Wagons and Truck Wagons:

Linn, who put the first tractor dump wagon in the field, was on hand with a 9-yd. Tractor Dump, powered by Waukesha gas. Diesel power is available, and the Cummins engine used for this power was shown alongside.

The Euclid juggernauts were present: a 10-yd. rear dump TracTruck, Cummins diesel powered, and a 15-yd. TracTruck wagon, bottom dump, semi-trailer type were shown, the latter Waukesha gas powered and a new model. These haulage units travel under their own power, in contrast to drawn types of most other makes.

Athey had the biggest wagon on the floor, an 18-yd. bottom dump on Athey track wheels, ratchet windup closing from a cam and cable arrangement off the tread of the track. An Athey two-way dump trailer wagon, good for 16 cu. yd., also on track wheels and equipped with automatic sideboards, was on display, hooked to D8 Caterpillar diesel tractor.

Allis-Chalmers showed the Patterson 14-yd. two-way hydraulic dump wagon, on Trackson crawler wheels, all-welded with a deep channel frame.

LeTourneau has a new type high level trailer wagon, a 15-yd. affair that dumps at the rear by the sides sliding back beyond the rear end of the bed. It is mounted as a cart on four 16x24-in. Goodyears, and naturally is cable operated.

Koehring showed two dirt haulers, the 5½-yd. Dumptor, rear dump trailer wagon, on four pneumatic tires, self dumping; and the 8-yd. Traildump, trailer type bottom dump wagon, all-welded construction.

LaPlante-Choate puts hydraulic control on its 13-yd. bottom dump wagon, equipped with rear hydraulic brakes and 18-in. tires.

Insley shows originality in equipping its 5-yd. two-wheel trailer bottom dump wagon with a 6-volt motor windup, taking juice from the truck battery. This rig is easy on the dirt, for it is spring mounted.

10. Trucks, Bodies, Trailers:

International featured a dual-drive, six-wheel truck chassis with flexible rear axles, all dual rear wheels and equipped with air brakes. Other International trucks included the two-batch dump model, and 2-yd. and 5-yd. dump trucks.

Mack displayed a Model ER chain-drive truck with a 5-yd. Heil dump body; a Model CJ Traffic Type carrying an Etnyre distributor; and a Model FC chain-drive with an 8-yd. Wood dump body.

General Motors took up a lot of space with a special built truck carrying—of all things, at a Road Show—a 20-yd. garbage body, and city officials sure were interested. There were still room in the G.M. booth for a G61H 10-truck with an 8-yd. Galion body.

Chevrolet showed a 2-ton chassis and cab, a 1-ton pickup, a 1½-ton with a Worthington compressor and Concretor concrete placer, and a Carcyall suburban model. White featured the cab-over-engine type of truck, showing the following: Model 802 low mounted with 4-yd. garbage body, Model 722 with 5-yd. Wood dump body, Model 718 with St. Paul 4-yd. dump, Model 802 with Heil 2-yd. dump and the Model 750 8-ton truck. White also had several models in other booths carrying various equipment.

Four Wheel Drive came out with two new models, the 5-ton Model SW with a 3½-yd. dump body and the Model HG 2½-ton size, high framed to carry a hydraulic mounted St. Paul maintainer.

Walter showed the 7-ton model equipped with the Snowfighter, mentioned above, and a new 8-yd. Heavy Duty Dumper, with all-welded body, up-sloping rear end. Hug exhibited a similar model, 8-yd. dumper known as the 87Q, all-welded and a high lifter. Hug also showed its new Cat diesel drive tractor unit with dual rear wheels.

St. Paul is keeping the Boulder Dam type of dump truck alive with the 8-yd. Hi-Dumper, which dumps on an angle of 75 deg. A new St. Paul 2-yd. dump body with half-hinged sides was combined on one truck chassis with a hydraulic road patrol blade.

Hercules Steel Products found room for a couple of spare tires under the bed of its new Tirepack dump body, 2-yd. capacity. Dump bodies of all sizes and types were also shown by Gar Wood, Galion All-steel Body and Perfection Steel Body.

Two heavy duty type of low-bed trailers were on display. Rogers Bros. Co. has a sweet 35-ton Model 35D of the drop deck type, equipped with sixteen rear pneumatic-tired wheels on seven rocking axles for all oscillations to accommodate uneven roadway surfaces. This model also has four front wheels and is equipped with Westinghouse air brakes, operating through a clever link arrangement that provides equalized braking action for all sets of wheels regardless of their position.

Freuhauf showed a lighter model, a 15-ton low bed rig on eight rear rubber wheels. It weighs only 9,000 lb., thus with its load keeps within most weight restrictions, and is equipped with Westinghouse air brakes. A four-wheel semi-trailer, vacuum braked, was also displayed by Freuhauf, carrying a Jaeger Roadbuilder concrete mixer.

Hough has designed a two-wheel trailer buggy, large tired, for speedy transporting of tractors. The axles clamp to the tractor frame.

11. Tractors:

The tractor sensation of the Show was the new Marmon-Herrington high-speed track-laying tractor, with wire-cored rubber treads. The 40-hp. diesel model was shown, though three diesels and three gas models are available, 20, 30 and 40 hp. Diesels will travel up to 23 m.p.h.; gas drives up to 33 m.p.h. The rubber tracks are said to be good for 5,000 miles of travel. The units have water-tight welded bodies, permitting fording of streams. It must be noted, however, that the drawbar horsepower ratings are for low gear travel, a maximum of 3 m.p.h. for gas and 2.2 m.p.h. for diesels. Cummins supplies the diesel units.

Case showed 15-hp. and 40-hp. industrial type wheeled tractors. Cummins had a MM-Twin City diesel on display.

It is impossible to describe all of the tractors on display by the four big manufacturers—International, Caterpillar, Cletrac and Allis-Chalmers. Cleveland showed a full line of gas and diesel drives, from 22 hp. to the giant new Cletrac FD1 95-hp. diesel. Caterpillar claims its new D8 diesel rates 96 hp., but your reporter is going to keep out of the way of both these new Cletracs and Cats, for their both mighty big brutes. Caterpillar had four other diesels and two gas tractors on the floor.

Allis-Chalmers featured its full line of controlled-ignition oil tractors, and also showed gas engine drives of all sizes, both crawler and wheel type. International had tractors all over the place, in their own and other spaces—diesels, gas driven, wheel and crawler types of all sizes.

12. Rollers and Tampers:

LaPlante-Choate had the only sheepsfoot roller on display, a two-drum type on oscillating axles. Osgood showed the Hercules road roller in the 10-ton, three-wheel model, equipped with a trailing Ironeroll, Cummins diesel power, hydraulic steering, gyroscopic front and rigidly connected to the end post.

Riddell had something new in rollers, the Warco Whizzard roller, variable weight single roll and a single wheel at the front of the frame. A neat feature is a transport trailer, simply dual wheels fastened to a folding axle that can be swung into hauling position at a moment's notice.

Austin-Western showed a three-wheel 10-ton roller with center Roll-a-plane. Galion Iron Works had five rollers on hand; an 8-ton variable weight tandem, gas powered, and with a streamlined nose; the Chief three-wheel 10-ton unit with Roll-a-Plane center roll, gas powered; ditto, diesel powered; a neat, brand new trench roller with a 20-in. roll for trenches up to 12 in. deep, designed for road widening; and a 7,300 lb. patcher.

Huber has a new model three-wheel Two-Plane roller with auxiliary center roll; the Huber 10-ton diesel three-wheel was also on display. Buffalo-Springfield left its big three-axle tandem roller at home, but brought along a cute working model of this 19-ton rig.

Now for more little fellows: C. H. & E. had a 3-ton tandem gas roller; Littleford showed its new No. 150 "Motorized" 3,600-lb. Wheeled Roller, equipped with brakes and a water tank.

Calhoun from California showed up with a tamper that was soon the talk of the town—the queer, hopping Delmag Leaping Lena, 2,200 lb. of battering weight that is under the control of an operator at all times. Rather than take a chance on pounding the floor to pieces, the Frog, as it is affectionately called, was taken to a nearby parking lot for demonstration. The same diesel explosive power principle has been applied to small Delmag tamper and hammer units. The 220-lb. unit, through explosive effort, will tamp earth or concrete for you, drive light sheeting, bust concrete, spade tough ground or spank the baby.

13. Sweepers, Mowers, Flushers:

Byers believes cleanliness is next to Godliness, so comes out with the new Byers White Wing, nimble little sweeper with a rotary gutter brush, a main 16-in. 33-in. pickup brush that extends the sweeping range to 4 ft., a 60-gal. water tank and a 14-cu. ft. refuse hopper. It ducks around parked cars with ease under its own Novo power.

Austin-Western has a new Motor Sweeper, rotary gutter brush and all, with a convertible main broom for sweeping or loading. Hough has a 6-ft. sweeper, non-loading, on the front end of an IH wheeled scraper. Looks like this would be fine for removing curing earth from new concrete slabs.

Let's take a look at mowers: International had a shoulder mower on one of its wheeled tractors; Fate-Root-Heath showed its Silver King mower on a wheeled tractor, gorgeous in silver splendor; and Centaur ended the cutter display with its Hi-Way mower, also on a wheeled tractor.

Etnyre was alone in the flusher field, showing a conventional tank, though literature hanging on the sides showed pictures of beautiful streamlined models.

14. Material Spreaders:

Buckeye Traction Ditcher had the most elaborate material spreader on the floor, a reversible trough type rig on two sets of dual pneumatic tires, adjustable 10-ft feed, adjustable height to accommodate different types of trucks. Good Roads also had an adjustable feed trough type on display, but its rotary types were more numerous, several models of various sizes, from sanders to stone throwers being shown.

All Purpose displayed its Junior and Senior models of rotary spreaders; Root Spring Scraper showed a new sander with belt drive from its own axle to permit lower spreading; and Galion Iron Works also had a sander on display.

Concrete and Aggregate Equipment

CONCRETE MIXERS and pavers were welcomed back to the Show after years of absence by an enthusiastic reception. The big pavers—double and single drums—led the parade. Smaller mixers were prominent.

15. Pavers:

Foote sprung the surprise of the Show by displaying its new 40-E paver, the largest ever built. This is a single drum machine with a loading skip as big as a tramp steamer hull, a 40-ft. trussed boom that looked twice as long on the crowded floor, and powered by a Hercules diesel engine. The machine weighs 67,000 lb. Frankly, the Foote people were skeptical as to the reception this new rig would get, but there seemed to be as much favorable as unfavorable comment on its possibilities and practicability. It is equipped with all the usual Foote refinements.

There were three double drum pavers on the floor. Two of the manufacturers went to the 34-E size for their duals, but Ransome, who started the idea way back in 1932, sticks to the 27-E size out of respect for the batching, hauling and accessory units. Ransome calls its machine the Dual Drum, and effects the transfer from first to second drum by means of a sealed chute that swings to discharge position at the right moment, otherwise ducks out of the way for mixing in the first drum. The sealed opening prevents dribbling through from first to second drum during the mixing cycle. The paver, with a 35-ft. boom, is equipped with all the necessary automatic and interlocking operating gadgets.

Koehring calls its new 34-E double drum paver the Twinbatch. It is equipped with a 35-ft. trussed boom and is powered by a Waukesha gas engine. The transfer from first to second compartment

of the drum is made by a chute that is turned to discharge position for the transfer, but at other times is turned and tilted downward to act as a stationary mixing blade. Though the opening around the chute is not sealed, the designer claims the position of the inverted chute prevents any material from dribbling through. Koehring dumps the mixed load into the center of the discharge bucket, claiming by this method absolutely no segregation in the last mixer operation.

Another 34-E double drum paver was displayed by Chain Belt, called both the Duomatic and the Roadmaker, they'll soon choose one name for good. This machine seems to have more automatic operations than the others through a mechanism known as the Mechanical Man. About all the operator does is to stamp on a pedal to start the works moving, and then release a brake to return the skip to loading position. The transfer arrangements between drums is quite different from other makes. A circular drum gate, similar to the discharge door on a transit mixer, is held closed during the mixing cycle. When transferring from one drum to the next, this door is pushed ahead to leave a ring opening 9 in. wide, the mix being discharged through action of the mixing blades. This rig also carries a 35-ft. boom.

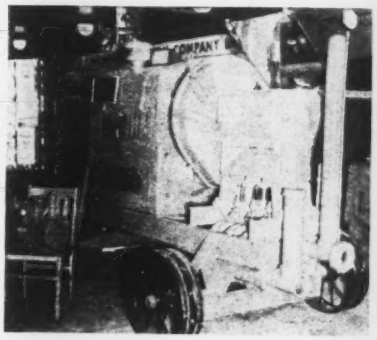
Smith, of Tilter fame, so far has steered clear of these double drum affairs, and is content at the moment with the standard 27-E single drum machine, of which one was on display. It carried a tower 29 ft. high, telescoping and folding type, with all the necessary hoist buckets, hoppers and chutes to make it attractive as a portable concrete plant. Of course this machine is convertible to a standard paver by adding a discharge boom.

16. Concrete Mixers:

Jaeger showed something new in mounting a 2½-yd. truck mixer on a Freuhauf semi-trailer. This is a new type of mixer that discharges from either side, a handy feature when truck-maneuvering space is limited. They call it the Roadbuilder, and it looks like no trick at all to skid the mixer off the trailer and convert it to a stationary unit. Jaeger also showed its well-known Dual Mix (not dual drum) 2½ yd. transit mixer on a Ford truck; another one just like it on another truck with Thronton tandem drive; the Bridge Builders Special, a two-bag rig on two wheels, equipped with the Shimmy Shaker skip; and ended its mixer display with a midget 3½-S tilter on two wheels.

Smith has a new style transit mixer, simply a regular 1½-yd. tilter on a truck — but the tilter doesn't tilt for the drum rotation is reversed for discharging, the blades kicking the mix out the spout pretty as you please. By the way, it has only two blades, and is turned over by power from an auxiliary Waukesha engine. As there is no opening at the rear of the drum, the water for the mix is pumped through the front end. Smith also showed 3½-S, 7-S and 10-S mixers, all end discharge.

Chain Belt displayed the old reliable Rex Moto Mixer, mounted on an International truck, 2½-yd. size, with the usual Jackass hoist for discharging. A 3½-S tilter, and skip load—Shimmy skip, if you please—sizes from 5-S to 14-S were all there.



MIDGET and GIANT . . .

The Koehring Kwik-Mix units, a 3½-S tilter and a skip load 5-S size were shown along with the Koehring Dandie 14-S end discharge, equipped with pump and batch meter.

Ransome showed a 4-yd. truck mixer and a 5-S power loader on two wheels. Transit Mixers were on hand with a 3½-yd. truck mixer on a White cab-over-engine chassis.

Construction Machinery displayed two 10-S mixers, one two-wheel end discharge, the other four-wheel side discharge, and a 3½-S Wonder tilter.

17. Screeds and Finishers:

Koehring has a new finishing machine, rather a screed, that operates longitudinally instead of transversely. It is used in connection with and after the regular finishing machine to take out the transverse waves. The frame is telescoping for various road widths, and carries an adjustable crown guide.

The Jaeger-Lakewood gas-electric finishing machine, with the new bell nose vibrating screed for internal vibration, was on display. Blaw-Knox showed its 12-ft. gas-electric finisher, adaptable to either concrete or bituminous finishing. A Flex-Plane adjustable strike-off machine for slab paving, and a Flex-Plane 9 to 15 ft. finishing machine with a 20-in. screed was shown by Heltzel.

18. Concrete Handling:

Construction Machinery and Jaeger both displayed concrete carts, steel and rubber tired. A model of the Lakewood concrete tower and chuting system was in the Jaeger booth. Blaw-Knox has something new and useful in a waterproofed fabric cement bag, which receives the cement at the batching plant through a flap closing bottom and discharges with the aggregate at the mixer, the bag being fastened to the truck. A 1-yd. Blaw-Knox roller gate bottom dump bucket was also shown.

Hercules Steel Products calls its cement gun type of concrete placer, mounted on a truck, the Crete-Mobile; a Worthington compressor is included to supply the air.

Chain Belt has come out with a new size portable Pumpcrete, the No. 160, all hooked up at the Show and pumping lime mortar round and round through Pumpcrete pipe and fittings. The Go-Devil and other Pumpcrete accessories were at hand.

Haiss displayed a troughing type portable belt conveyor, 24-in. belt, 25 ft. long. Jeffrey showed conveyor units.

19. Batchers, Bins, Scales:

Heltzel crowded a full size Trailer Batcher Weighing Bin into his booth. Blaw-Knox showed a cement weighing batcher and a triple aggregate weighing batcher. Butler exhibited two types of bulk cement handling plants: the conventional type with weighing batcher and undertrack screw with bucket elevator for unloading hopper bottom cars; and a new design with inclined screw elevator for unloading box cars. Butler also showed a model of an aggregate batching bin and a wheelbarrow scale.

Fairbanks Morse and Iowa displayed platform and wheelbarrow scales.

20. Vibrators and Grinders:

Vibration is certainly the thing in concrete placement, if the array of vibrators on display are any indication. White had a line of gas-driven vibrators and grinders. Master Vibrator had six units on hand, all of the internal type. Mall showed a dozen or so vibrators of different sizes, and several grinders. Chicago Pneumatic has a new line of grinders and right-angle surfacers, and four vibrators.

Electric Tamper has a new type Jackson vibrator, the Vibratory Paving Tube which fits on a screed or finishing machine and operates the full width of the slab. It was shown on a Jaeger screed. There were numerous Jackson pneumatic, electric and hydraulic vibrators and grinders on display, including a pipe form vibrator and also a backfill tamper.

21. Screens and Crushers:

Simplicity Engineering showed a 5x 10-ft. triple deck gyratory sand and gravel screen that attracted lots of attention. Smith Engineering Works relied upon a truly working model of the Telsmith crushing and screening plant to attract attention. It did, all right, for equipped with tiny jaw and gyratory crushers, bucket elevators and vibrating screens, it reduced 1-in. aggregate to finer components right before your eyes.

Eagle Crusher has a new portable crusher and loader, equipped with a 10x 20-in. jaw crusher. A trailer mounted, power takeoff model 10x20-in. jaw crusher was also shown by Eagle. Both machines have SKF bearings.

Rogers Iron Works had a large working model of the Rogers-Joplin crushing and screening plant with jaw crusher, rotary screen and sand rolls, and also showed a 9x24-in. Timken bearing jaw crusher. Pioneer displayed models of its crushers and screening plants—they actually screened and crushed.

The following crushers were also on

display: Jeffrey, 12x20-in. hammer mill; Gruendler, 2XB hammer mill and 10x16-in. jaw; Universal, 12x18-in. hammer mill and 10x16-in. jaw; Williams Patent, Bearcat 18-in. hammer mill, also models of large hammer mill and vibratory sceen; Diamond Iron Works, 15x36-in. jaw, 20x30-in. roll crusher, both Timken equipped; Iowa, Cedar Rapids 30x18-in. roll, 10x36-in. reduction crusher and Symons vibrating deck screens.

Bituminous

THE BUILDING of bituminous roads is becoming more and more of a scientific job, requiring suitable equipment. From the display at the Show, equipment is available for every need.

22. Roadbuilders:

This machine is hard to classify and harder yet to describe. Blaw-Knox calls it the Roadbuilder, so we'll follow along. It is an 18-ton rig, traveling on crawlers under its own power, that digs up a scarified roadbed to which a stabilization or binding agent has been applied, pulverizes the material and lays it in a wide windrow behind. It makes a cut 10 ft. wide and 12 or 13 in. deep. Equipped with target control, it walks the straight and narrow down the road. An attachment is available, though not shown, for applying liquid stabilizers and binders through the machine. Flynn developed the rig, and he says it works.

23. Traveling and Portable Plants:

Iowa has a new Speedline portable asphalt plant that certainly loomed up big at the Show. It moves on pneumatic tires, and does the complete job from loading the cold aggregate through the drying and heating, screening, mixing and weighing operations, discharging the hot mix over a conveyor belt. The dryer is 4 ft. in diameter, 10 ft. long; aggregate bins are divided into three compartments. The whole rig is carried on one big frame.

Barber-Greene showed a new bituminous mixer that can be used for both traveling and central plant operation. Normally it is a portable central plant, but when used in connection with a Barber-Greene traveling loader, the two make a traveling plant for stabilization or surfacing work. It will discharge into a truck, spreader, finisher or windrow. The machine is not self-propelled.

Jaeger showed its Roadbuilder, a self-propelled diesel powered machine for bituminous or stabilized road mix. It is a huge machine, and is equipped with a pugmill mixer, distributor and spreader-finisher.

24. Pavers and Spreaders:

Jaeger displayed its bituminous paver for hot or cold mix, equipped with heated screeds, self-propelled through semi-crawler wheels. It is adjustable in width from 9 to 14 ft., and has straight edge runner screed supports. The Jaeger adjustable spreader, 8 to 11 ft. wide and 1 to 10 in. deep, was also shown, on straight edge runners; it is a pulled rig.

SCENERY . . .

Littleford showed a model of its new Surfacing Drag, which, in real life, is 24 ft. long, built for road mix bituminous surfacing work. It is equipped with several staggered rows of free-floating plows with a strikeoff blade in the center, and its chief jobs are leveling, resurfacing and wedge course work.

Barber-Greene displayed the B-G bituminous laying and finishing machine. A bar conveyor feed, and 3-ton hopper are features. It is self-propelled, operates on crawlers, and lays, screeds, tamps and finishes the mix.

The Adnun blacktop paver, shown by Foote, is now hydraulic controlled. Foote also showed the Adnun bituminous spreader and finisher; both machines received lots of attention.

25. Distributors:

Etnyre had three Blacktopper bituminous distributors on the floor, two 1,000-gal. and one 1,500-gal. sizes, the latter on a Mack truck, while the two smaller rigs were on Internationals. South Bend showed a 1,000-gal. distributor on a Studebaker chassis, diesel power for the pumps. Kinney has a lot of new valves, pneumatic controlled, on its 1,000-gal. distributor, shown on a White cab-over-engine chassis. Littleford showed the C-10 pressure distributor, 1,000-gal. size, on a similar chassis.

26. Mixers and Heaters:

Koehring displayed the No. 6 Kwik-Mix bituminous heater, a 6-cu. ft. size mounted on two wheels. Cummer showed an unmounted 2-ton special jacketed asphalt mixer, equipped with patented two-piece teeth, and Jaeger showed a four-wheeled 10-cu.ft. mixer and heater.

Cleaver Brooks had its two-car Tank Car Heater on a White truck, and also showed the new Cleaver fully automatic asphalt heating plant, 200 lb. working pressure with automatic burner control.

White displayed tar and asphalt kettles; heaters and kettles were shown by Littleford; while heaters alone were on display by MacLeod and Aeroil, the latter having something novel in a constant spark heater for distributors, the repeating spark assuring a lighted burner at all times. Littleford also had the No. 101 Utility Spray Tank, trailer type.

Compressed Air

AIR-COOLED COMPRESSORS are the trend in the air power field. Diesels are becoming the favorite driving units. Universal mountings or wagon drills, new only two years ago, are meeting with great favor. Automatic feed is now common on the drifter type of drill.

27. Compressors:

The Airmaster, a new portable compressor by LeRoi, was just about the neatest and most striking piece of equipment in the whole Show. Ultra-streamlined, painted bright yellow, trimmed in nickel plate, mounted on rubber-tired cast wheels, it stopped the crowd in their tracks. It is a 160-ft. two-stage, air-cooled unit. LeRoi also showed its 60-ft. utility model, air cooled, on two wheels.

Gardner Denver displayed a new 85-ft. portable compressor, a short, compact utility model on two wheels. They have also gone in for the popular W type of heavy duty portable, in which six cylinders are fanned out in three sets of two each, two on a V, with one set vertical between them. The model shown was a 210-ft. size, Caterpillar diesel drive, water cooled compressor.

Schramm is proud of his new V type combined portable, 55-ft. size mounted on two pneumatic tires. He uses a regular Ford V-85 gas engine, converts two cylinders on each side to air, drives off the remaining four cylinders and has a most compact little rig. By using two V-eights in line, converting half the cylinders to air, he has a compact 110-ft. portable no larger than other rigs of half the capacity. Schramm also showed a whopper of a compressor, a 420-ft. portable on steel wheels, water cooled, driven by a Buda diesel. Other units in the Schramm booth included a 350-ft. gas, a 210-ft. gas and a DeLuxe 105-ft. utility model on a two-wheel trailer.

Worthington showed two new compressors, one a 310-ft. diesel driven air cooled portable, two-stage radial type (same as the W type) direct connected by an enclosed clutch. The other unit is identical as to design, except for size and power, being a 105-ft. rig on two wheels, gas-driven.

Sullivan put its big 445-ft. new model on skids, and calls it a semi-portable compressor. It is a V-type two-stage unit, diesel driven and water cooled, with renewable honed cross-head guides and cylinder liners. A two-wheel trailer type, 105-ft. size, with the Frosto evaporator to prevent airlines freezing, was also shown by Sullivan.

Chicago Pneumatic builds its two stage large portables as vertical-in-line types. A 315-ft., air cooled, diesel drive on four steel wheels was shown. It is 16 ft. from nose to tail. A 105-ft. two-stage air cooled unit on four wheels was also shown.

Ingersoll-Rand filled a large corner with six portables, air cooled W type in 55-ft., 85-ft., 105-ft., 160-ft., 210-ft. and 315-ft. sizes, the last oil engine drive, and the last three on four wheels.

Davey is trying something new in compressors—air cooled portables with com-

pressor and engine placed side by side, multiple V-belt connected. This idea certainly broadens the front view, but shortens the side view considerably. Two models were shown, both two-stage units, a 315-ft. diesel drive, and a 105-ft. gas drive.

28. Drills and Bits:

A full line of pneumatic tools, such as drifter and sinker drills, spades, tampers, sump pumps etc. was shown by Independent Pneumatic Tool (Thor line), Chicago Pneumatic, Gardner Denver, Ingersoll-Rand, Sullivan, Cleveland Rock Drill, and Worthington. Detachable bits were displayed by Timken, Sullivan and Ingersoll-Rand.

29. Wagon Drills:

The latest types of universal mountings for drifter drills, or all-position wagon drills as they are better known, were on display by most of the drill makers. Ingersoll-Rand uses an air motor, 8-ft. feed; Cleveland has a combination pneumatic and chain feed, 8-ft. reach; Gardner Denver uses a pneumatic-chain feed also with a 1:2 ratio on travel, 6-ft. range; the Thor wagon drill also uses a pneumatic-chain feed, 6-ft. reach; Chicago Pneumatic employs an air motor to drive an 8-ft. chain feed; while Sullivan uses a straight pneumatic 6-ft. feed.

Cleveland also showed a 10-ft. standard wagon drill, adjustable in one plane only. Sullivan has a new wagon drill, which carries sinker type drills, called the Jigger Feed, actuated by vibration through cams and gears, driving a chain feed.

30. Drill Grinders and Sharpeners:

Detachable bit grinders were shown by Sullivan, Ingersoll-Rand and Gardner Denver. Ingersoll-Rand also displayed steel sharpeners and furnaces.

Pumps, Power Plants

LIGHT WEIGHT and small size pumps were numerous, usually powered by tiny air-cooled gas engines. Heavy road pumps are coming back, required by today's long daily runs in laying concrete slab. Power plants are predominately diesel. Generating plants are increasing in demand.

31. Pumps:

There were so many pumps of all types and sizes shown that it is impossible to list them all. The best we can do is to give the manufacturer's name and the types of pumps shown.

Novo, pressure, triplex road and centrifugal; Fairbanks Morse, small centrifugal and simplex piston, electric drive; Barnes, duplex road, diaphragm and centrifugal; Construction Machinery, dual-prime centrifugal; Marlow, diaphragm, light and heavy centrifugal; Gorman Rupp, triplex road, light and heavy centrifugal; Sterling, all-aluminum, single and double stage centrifugal; C. H. & E., diaphragm, Fly-Wate and standard centrifugal; and Chain Belt, speed-prime centrifugal, vertical triplex road.

32. Engines and Generators:

Here again it is impossible to even list all the engines, power units and generators sets that were shown, but we'll list the manufacturers of this equipment for you.

Buda, gas and diesel engines and generators; Allis-Chalmers, gas engine power units; International, gas and diesels; Hercules Motors, gas and diesels; Caterpillar, gas and diesel engines and generating sets; Cummins, all diesel, up to 500 hp.; Fairbanks Morse, gas, diesel and electric, generating sets; United Motors Service, Delco generating sets and batteries; Novo, air and water cooled gas; Stover, 5-hp. diesel and air cooled gas, single and twin-cylinder; Murphy, nothing but diesels, but they look sweet; Air Cooled Motors, the Franklin air-cooled gas engine revived for industrial use; Continental Motors, gas power units and generating sets; Waukesha feature Hesselman oil and Hy-Power gas engines; Wisconsin, air-cooled gas in smaller units, water-cooled in larger sizes.

33. Welding Equipment:

Harnischfeger showed a 150-amp. welder, two-wheel trailer mounted, air-cooled gas engine drive; and also the Hanson motor-driven one-control 200-amp. welder. A transformer type welder, 250-amp. size, was displayed by Master Vibrator. American Manganese Steel showed lots of Amsco welding rod.

Miscellaneous

NEVER WAS SUCH a variety and quantity of small items, tools, parts, materials and accessories shown at a Road Show. A reporter is helpless to describe them all, but an attempt will be made to hit the high spots.

34. Signs and Signals:

Something new in highway center stripes was shown by Highway Safety Products—a globular glass product that is applied to wet stripe paint, with the result the center stripe becomes luminous at night from a driver's own headlights, but does not shine from the lights of oncoming cars. The physics of light reflection and refraction through spheres explains it. It's called the Refractolite Process. Municipal Supply Co. also has a similar product, known as Prismo Luminous Traffic Stripe. Both firms have the machines for applying the product.

Aeroil had a traffic stripe marker. Littleford showed its Traf-o-Dot markers; Signal Service its Line-o-Lite traffic markers, illuminated rubber inserts made jointly with Firestone, stop lights and highway signs and signals; Michigan Malleable Iron its Ready Insert traffic stop signs, spring release; National Colortype its plain and reflector signs. Aeroil displayed a line of reflector button strips for signs and signals.

35. Guard Rail:

Band or tape type of guard rails were shown by Laclede Steel, Armco Iron, Pittsburgh Steel, National Traffic Guard, and Tuthill Spring. Cable type guards were displayed by U. S. Steel, Bethlehem Steel, and Highway Steel Products.

36. Surface Materials and Binders:

Calcium Chloride: Calcium Chloride Ass'n, Dow Chemical Co., Solvay Sales Corp. Tar: Barrett Co., Koppers Co. Brick: National Paving Brick Ass'n. Cement: Portland Cement Ass'n. Asphalt: The Asphalt Institute, Ohio Oil Co., Standard Oil Co. of Ohio.

37. Culverts, Drains, Floors:

Culvers: Armco Iron, Toncan, Republic. Drains: Dimick Mosher Skip Pipe, a sloping cradle invert pipe. Tunnel liner plate: Truscon. Flooring: Philip Carey; U. S. Steel; Blaw-Knox-Irving. Bin type retaining wall: Armco.

38. Reinforcing Joints, Forms:

Bars and mesh: U. S. Steel, Truscon, Bethlehem, Laclede, and Pittsburgh Steel. Joints and fillers: Truscon, Philip Carey, Heltzel, Laclede, Highway Steel Products, Goodrich Rubber, Pittsburgh Steel, Godwin, American Concrete Expansion Joint. Forms: Blaw-Knox, Heltzel, Truscon.

39. Misc. Plant and Tools:

Hole diggers: Hughes-Keenan, Buda. Hoists: American Hoist & Derrick, Ingersoll-Rand, Sterling Machinery, Gar Wood-Mead Morrison, Construction Machinery, Jaeger, Willamette Hyster.

Wire rope: Leschen, Broderick & Bascom, Macwhyte. Steel sheeting, piles: U. S. Steel, Bethlehem, Union Metal. Pile driving: Vulcan Super hammers, Calhoun Delmag explosion hammer.

Aeroil weed burner; Jeffrey dry feeder; Advanced Concrete Road Curing Co. cotton mats; Lufkin rules; Hamilton drawing board and filing cabinets; Novo concrete breaker (drop hammer); Sterling power saws; C. H. & E. power saws; Ingersoll-Rand pavement tester; Jaeger form tamper; Koehring new streamlined mud jack; Blackhawk hydraulic jacks; Warren Knight surveying instruments; Heltzel subgrade tester and joint trimmers.

40. Misc. Parts and Materials:

Anti-friction bearings: SKF; Roller Bearing Co. of America; Tyson; and Timken. Oils and greases: Sinclair; Macmillan; Gulf; Standard Oil of California (RPM line); and D-A Lubricants.

Thornton Tandem four-wheel rear drive for trucks; Black & Decker soil stability testers, electric small tools and Loadometer scales; Walker bituminous distributor bar; Electric Wheel Co. wheels; Lincoln lubrication equipment; Stewart Warner Alemite lubrication equipment; Morin hydraulic clutches and steering mechanisms; Transmission & Gear transmissions and gear reducers; Bendix Westinghouse air brakes; Geneva metal wheels; Eaton axles; Fairbanks Morse magnetos; Motor Improvements Purolator oil filters; Rodgers hydraulic pistons and controls.

Rockford clutches; Chicago Rawhide leather packing; Donaldson air cleaners; S. K. Wellman clutch facings; Racine hydraulic pumps; Edison Splitdorf magnetos; Bendix Products magnetos, vacuum

brakes, carburetors; Spicer clutches and axles; United American diesel injector equipment; Timken diesel injector equipment; Vickers hydraulic controls; Wico automotive ignitions; Fuller gear reductions; Twin disc clutches; American Manganese dipper liners and bucket teeth.

41. Literature Only:

Those firms having booths but limiting their displays to literature and photos were: Browning cranes; Farasey asphalt plants; Anthony dump bodies; Kennedy-Van Saun gearless crushers; Sauerman slackline cableways; Wheeling corrugated culverts and welded fabric; Hetherington & Berner asphalt plants; and Evans Products auto stop barrier.

42. Publications:

Publications represented included: Engineering News-Record; Construction Methods and Equipment; Roads & Streets; American City; Contractors & Engineers Monthly; and Public Works.

43. Educational:

Too bad there isn't space to describe the many fine educational displays. Included were those of: W.P.A.; Aetna Casualty & Surety Co.; American Association of State Highway Officials; Mexico; California; Oregon; Ohio; Arkansas; Nevada; U. S. Bureau of Public Roads; Michigan; Minnesota; U. S. Dept. Commerce; Cleveland; Case School of Applied Science; and Cuyahoga County.

Directory of Exhibitors

Numbers refer to sections in which exhibitor's products are described.

J. D. Adams Co., Indianapolis—5.
Advanced Concrete Road Curing Co., New Haven, Conn.—39.
Aeroil Burner Co., Inc., West New York, N. J.—26-39.
Air Cooled Motors Corp., Syracuse—32-34.
All Purpose Spreader Co., Elyria, O.—14.
Allis Chalmers Co., Milwaukee—5-9-11-32.
American Concrete Expansion Joint Co., Chicago—38.
American Hoist & Derrick, St. Paul—39.
American Manganese Steel Co., Chicago Heights, Ill.—33-40.
Anthony Co., Inc., Streator, Ill.—41.
Armco Culvert Mfrs. Ass'n., Middletown, O.—35-37.
Asphalt Institute, New York—36.
Athey Truss Wheel Co., Chicago—9.
Austin Western Road Machinery Co., Aurora, Ill.—3-5-12-13.
Baker Mfg. Co., Springfield, Ill.—3-4-5-8.
Barber-Greene Co., Aurora, Ill.—23-24.
Barnes Mfg. Co., Mansfield, O.—31.
Barrett Co., New York—36.
Bay City Shovels, Bay City, Mich.—1-7.
Bendix Products Corp., South Bend—40.
Bendix-Westinghouse Automotive Air Brake Co., Pittsburgh—40.
Bethlehem Steel, Bethlehem, Pa.—35-38-39.
Black & Decker Mfg. Co., Towson, Md.—40.
Blackhawk Mfg. Co., Milwaukee—39.
Blaw-Knox Co., Pittsburgh—7-16-17-18-19-23-37-38.
Broderick & Bascom Rope, St. Louis—39.
Browning Crane & Shovel, Cleveland—41.
Buckeye Traction Ditcher Co., Findlay, O.—1-6-14.
Bucyrus Erie Co., So. Milwaukee—1-7.
Buda Co., Harvey, Ill.—32-39.
Buffalo Springfield Roller Co., Springfield, O.—12.
Butler Bin Co., Waukesha, Wisc.—19.
Byers Machine Co., Ravenna, O.—1-13.
Calhoun Co., Los Angeles—12-39.
Calcium Chloride Ass'n., Detroit—36.
Philip Carey Co., Lockland, O.—37-38.
J. I. Case Co., Racine, Wisc.—11.
Caterpillar Tractor Co., Peoria—5-6-11-32.
Centaur Tractor Corp., Greenwich, O.—13.
C. H. & E. Mfg. Co., Milwaukee—12-31-39.
Chain Belt Co., Milwaukee—15-16-18-31.
Chevrolet Motors, Detroit—10.
Chicago Pneumatic Tool Co., New York—20-27-28-29.
Chicago Rawhide Mfg. Co., Chicago—40.
Cleaver-Brooks Co., Milwaukee—26.
Cleveland Rock Drill Co., Cleveland—28-29.
Cleveland Tractor Co., Cleveland—6-11.
Construction Machinery Co., Waterloo, Ia.—16-18-31-39.
Construction Methods & Equipment, New York—42.
Continental Motors Corp., Muskegon,—32.
Continental Roll & Steel Fdry., East Chicago, Ind.—3.
F. D. Cummer & Son Co., Cleveland—26.
Cummins Engine Co., Columbus, Ind.—11-32.
D-A Lubricant Co., Indianapolis—40.
Davey Compressor Co., Inc., Kent, O.—27.
Diamond Iron Works, Minneapolis—21.
Dimick Mosher Products Co., Boston—37.
Donaldson Co., Inc., St. Paul—40.
Dow Chemical Co., Midland, Mich.—36.
Eagle Crusher Co., Galion, O.—21.
Eaton Mfg. Co., Cleveland—40.
Edison Splitdorf Corp., W. Orange, N. J.—40.
Electric Wheel Co., Quincy, Ill.—40.
Electric Tamper & Equip. Co., Ludington, Mich.—20.
Emsco Derrick & Equip., Chicago—3-4-5.
Engineering News-Record, New York—42.
E. D. Etnyre & Co., Oregon, Ill.—13-25.
Euclid Road Machinery Co., Cleveland—9.
Evans Products Co., Detroit—41.
Fairbanks, Morse & Co., Chicago—19-31-32-40.
J. D. Farasey Mfg. Co., Cleveland—41.
Fate-Root-Heath Co., Plymouth, O.—13.
Firestone Rubber Co., Akron, O.—34.
Foote Co., Inc., Nunda, N. Y.—15-24.
Four Wheel Drive Auto Co., Clintonville, Wisc.—10.
Fruehauf Trailer Co., Detroit—10.
Fuller Mfg. Co., Kalamazoo, Mich.—40.
Galion Allsteel Body Co, Galion, O.—10.
Galion Iron Works, Galion, O.—5-12-14.
Gardner Denver Co., Quincy, Ill.—27-28-29-30.
General Motors Truck, Pontiac, Mich.—10.
Geneva Metal Wheel Co., Geneva, O.—40.
Gledhill Road Mach. Co., Galion, O.—5.
W. S. Godwin Co., Baltimore—38.
B. F. Goodrich Co., Akron, O.—38.
Good Roads Machinery Corp., Kennett Square, Pa.—8-14.
Gorman Rupp Co., Mansfield, O.—31.
Gruendler Crusher & Pulverizer Co., St. Louis—31.
Gulf Oil Corp., Pittsburgh—40.
Haiss Mfg. Co., Inc., New York—6-7-18.
Hamilton Mfg. Co., Two Rivers, Wisc.—39.
Hanson Clutch & Mach. Co., Tiffin, O.—1.
Harnischfeger Corp., Milwaukee—1-33.
Heil Co., Milwaukee—3.
Heltzel Steel Form & Iron Co., Warren, O.—5-17-19-38-39.
Hercules Motors Corp., Canton, O.—32.
Hercules Steel Products, Galion, O.—10-18.
Hetherington & Berner, Indianapolis—41.
Highway Safety Products, New York—34.
Highway Steel Products Co., Chicago Heights, Ill.—35-38.
F. G. Hough Co., Chicago Heights, Ill.—2-4-10-13.
Huber Mfg. Co., Marion, O.—5-12.
Hug. Co., Highlands, Ill.—10.
Hughes-Keenan Co., Mansfield, Ill.—39.
Hyatt Bearings Div., General Motors, Newark, N. J.
Independent Pneumatic Tool Co., Chicago—28-29.
Ingersoll-Rand Co., New York—27-28-29-30-39.
Insley Mfg. Co., Indianapolis—1-6-9.
International Harvester Co., Chicago—10-11-13-32.
Iowa Mfg. Co., Cedar Rapids, Ia.—19-21-23.
Jaeger Machine Co., Columbus, O.—5-16-17-18-23-24-26-39.
Jeffrey Mfg. Co., Columbus, O.—6-18-21-39.
Kennedy-Van Saun Mfg. & Eng. Co., New York—41.
Killefer Mfg. Corp., Ltd., Los Angeles—3-5.
Kinney Mfg. Co., Boston—25.
Klauer Mfg. Co., Dubuque, Ia.—8.
Koehring Co., Milwaukee—1-9-15-16-17-26-39.
Koppers Co., Pittsburgh—36.
Laclede Steel Co., St. Louis—35-38.
LaPlante Choate Mfg. Co., Cedar Rapids, Ia.—3-4-9-12.
LeRoi Co., Milwaukee—27.
A. Leschen & Sons Rope Co., St. Louis—39.
R. G. LeTourneau, Peoria, Ill.—3-4-5-9.
Lima Locomotive Works, Inc., Lima, O.—1.
Lincoln Engineering Co., St. Louis—40.
Link-Belt Co., Chicago—1.
Linn Mfg. Corp., Morris, N. Y.—9.
Littleford Bros., Cincinnati—12-24-25-26-34.
Lufkin Rule Co., Saginaw, Mich.—39.
Mack Trucks, Long Island City, N. Y.—10.
Mac Leod Co., Cincinnati—26.
MacMillan Petroleum, Los Angeles—40.
Macwhyte Co., Kenosha, Wisc.—39.
Mall Tool Co., Chicago—20.
Marion Steam Shovel Co., Marion, O.—1.
Marlow Pumps, Ridgewood, N. J.—31.
Marmon-Herrington Co., Indianapolis—11.
Master Vibrator Co., Dayton, O.—20-33.
Michigan Malleable Iron Co., Detroit—34.
Michigan Power Shovel Co., Benton Harbor, Mich.—2.
Morin Mfg. Co., Holyoke, Mass.—40.
Motor Improvements, Newark, N. J.—40.
Municipal Supply Co., South Bend—34.
Murphy Diesel Co., Ltd., Milwaukee—32.
National Colortype Co., Bellevue, Ky.—34.
National Paving Brick Ass'n., Washington, D. C.—36.
National Traffic Guard Co., Atlanta, Ga.—35.
Northwest Engineering Co., Chicago—1.
Novo Engine Co., Lansing, Mich.—31-32-39.
Ohio Oil Co., Robinson, Ill.—36.
Osgood Co., Marion, O.—1-12.
Owen Bucket Co. Cleveland—7.
Perfection Steel Body Co., Galion, O.—10.
Pioneer Engineering Works, Minneapolis—21.
Pittsburgh Steel Co., Pittsburgh—35-38.
Portland Cement Ass'n., Chicago—36.
Racine Tool & Machine Co., Racine—40.
Ransome Concrete Machinery Co., Dunellen, N. J.—15-16.
Republic Steel Co., Cleveland—37.
W. A. Riddell Co., Bucyrus, O.—5-12.
Rockford Drilling Machine Div. of Borg Warner, Rockford, Ill.—40.
Rodgers Hydraulic, Inc., Chicago—40.
Rogers Bros. Corp., Albion, Pa.—10.
Rogers Iron Works Co., Joplin, Mo.—21.
Roller Bearing Co. of America, Trenton, N. J.—40.
Root Spring Scraper Co., Kalamazoo—5-14.
Ross Co., Crestline, O.—8.
St. Paul Hydraulic Hoist Co., Minneapolis—5-10.
Sauerman Bros., Inc., Chicago—41.
Schramm, Inc., West Chester, Pa.—27.
Signal Service Corp., Elizabeth, N. J.—34.
Simplicity Engineering Co., Durand, Mich.—21.
Sinclair Refining Co., New York—40.
SKF Industries, Inc., Philadelphia—40.
T. L. Smith Co., Milwaukee—15-16.
Smith Engineering Works, Milwaukee—21.
Solvay Sales Corp., New York—36.
Southwest Eng. Works, Alhambra, Cal.—3.
Speeder Machinery Corp., Cedar Rapids, Ia.—1-2.
Spicer Mfg. Co., Toledo, O.—40.
Standard Oil Co. of California—40.
Standard Oil Co. of Ohio—36.
Sterling Machinery Corp., Kansas City, Mo.—31-39.
Stewart-Warner Corp., Chicago—40.
Stover Mfg. & Eng. Co., Freeport, Ill.—32.
Sullivan Machinery Co., Michigan City, Ind.—27-28-29-30.
Thew Shovel Co., Lorain, O.—1.
Thornton Tandem Co., Detroit—40.
Timken Roller Bearing Co., Canton, O.—28-40.
Toncan Culvert Mfrs. Ass'n., Cleveland—37.
Trackson Co., Milwaukee—2-4.
Tractor Shovel Co., New York—2-4.
Transit Mixers, Inc., New York—16.
Transmission & Gear Co., Detroit—40.
Truscon Steel Co., Youngstown, O.—37-38.
Tuthill Spring Co., Chicago—35.
Twin Disc Clutch Co., Racine, Wisc.—
Tyson Roller Bearing Co., Massilon, O.—40.
Union Metal Mfg. Co., Canton, O.—39.
United American Bosch Corp., Springfield, Mass.—40.
United Motors Service, Inc., Detroit—32.
United States Steel Corp., Pittsburgh—35-37-38-39.
Universal Crusher, Cedar Rapids, Ia.—21.
Universal Power Shovel Corp., Milwaukee—1.
Vickers, Inc., Detroit—40.
Vulcan Iron Works, Chicago—39.
Earl Walker Co., Sullivan, Ill.—40.
Walter Motor Truck Co., Ridgewood, N. Y.—8-10.
Warren Knight Co., Philadelphia—39.
Waukesha Motor Co., Waukesha, Wisc.—32.
Wellman Engineering Co., Cleveland—7.
S. K. Wellman Co. Cleveland—40.
Wheeling Corrugating Co., Wheeling, W. Va.—41.
White Mfg. Co., Elkhart, Ind.—6-20-26.
White Motor Co., Cleveland—10.
Wico Electric Co., Springfield, Mass.—40.
Willamette Hyster Co. Portland, Ore.—39.
Williams Patent Crusher, St. Louis—21.
Wisconsin Motor Corp., Milwaukee—32.
Gar Wood Industries, Detroit—3-4-10-39.
Worthington Pump & Mach. Corp., Harrison, N. J.—27-28.

Hawaii Builds Long Rigid Frame

by WILLIAM R. BARTELS
Bridge Engineer, Territorial Highway Department, Honolulu

Concrete rib structure of 125 ft. span on Kauai Island also includes cantilever side spans

DURING recent years a number of notable bridges have been constructed on the various islands of the Territory of Hawaii under the supervision of the territorial highway department, and among these the Wahiawa Gulch Bridge on the island of Kauai is probably of widest interest because it is a concrete rigid frame with a main span of 125 ft. Cantilever side spans of 28½ ft. each bring the total length of the bridge to 182 ft. Choice of this type and size of structure was based on the general topography of the ground, the skew stream course to be crossed and the 30 ft. high approach fills that were necessary to carry the highway, the Kauai Belt Road, over the 700-ft. wide gulch.

Completed last year, the Wahiawa Bridge has a 24-ft. roadway and one 5-ft. sidewalk. It was designed for an H-15 loading, using a 650 lb. per sq.in. concrete stress and an 18,000 lb. per sq.in. steel stress. The analysis of the frame was done by the method of fixed points. Live load moments, shears and reactions were determined with the help of influence diagrams. A temperature variation of ± 30 deg. F. and the effect of shrinkage were considered in the design.

The supporting structure consists of three ribs of a uniform thickness of 2 ft., depths varying from 4½ ft. at the center to 9 ft. at the haunch in the main span and from 3½ ft. to 8 ft. in the cantilevers. The main girders have 40 ft. long parabolic haunches while the middle portion, also 40 ft. long, has a uniform depth, an arrangement that gives the structure a light and graceful appearance. The ribs are placed at 11½ ft. center to center.

On account of the heavy negative moments at the supports it was necessary to provide the girders with bottom flanges which were made 12 in. thick and taper from an 18-in. width each side of the girder at the supports to zero at the ends of the haunches. These flanges are not visible in elevation, being hidden behind a 6-in. curtain wall which spans between the flanges and the canti-

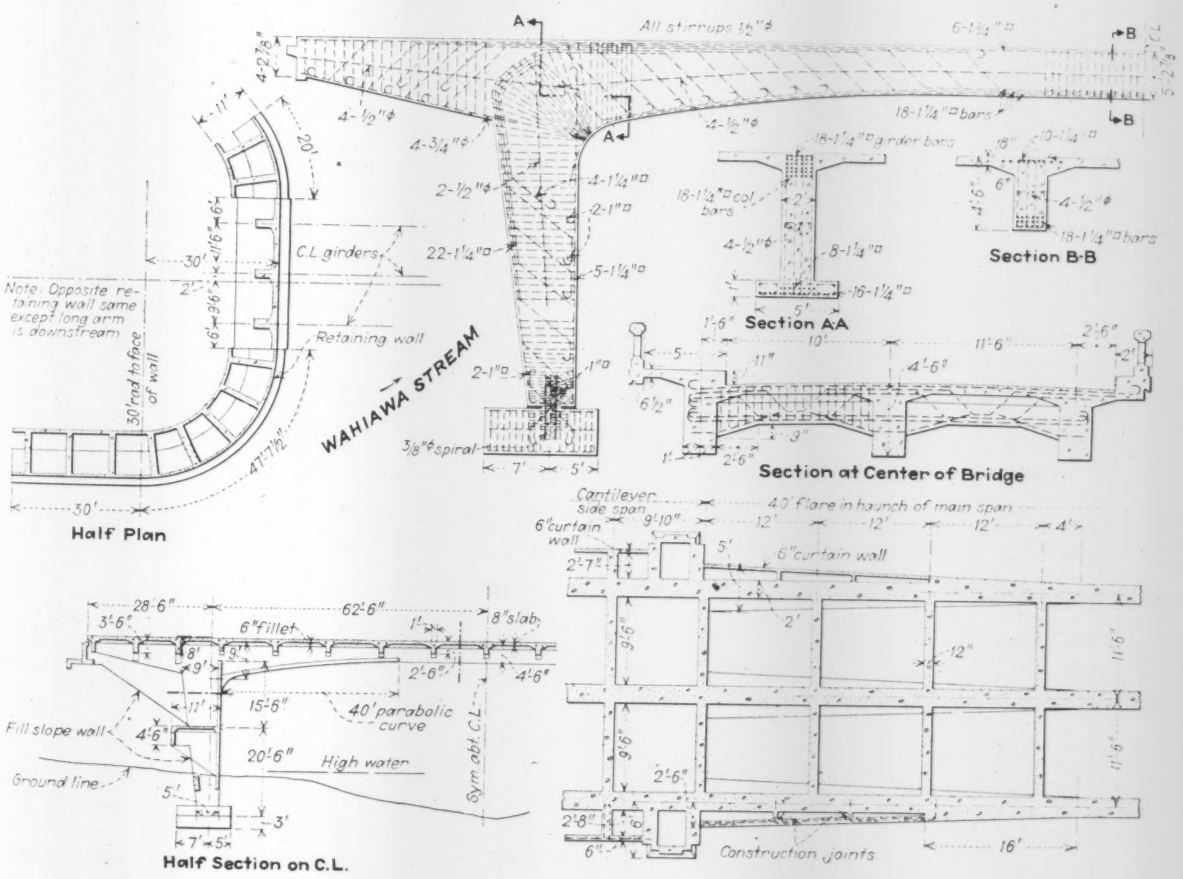


Fig. 1. **Details of rigid frame bridge in Hawaii reveal such characteristics as cantilever side spans, curved retaining walls, flanged ribs and architectural curtain walls.**

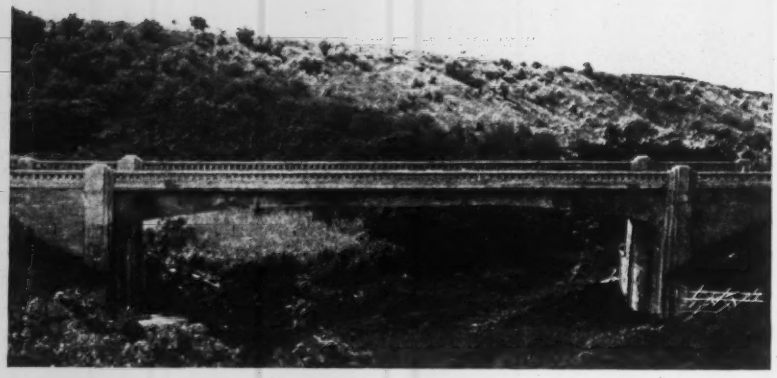


Fig. 1. Rigid frame bridge of 125 ft. span center to center of hinges built for H-15 live loading in Hawaii.

levered deck and sidewalk slabs respectively; a 1-in. open joint at the top of the curtain walls precludes any stresses from being transmitted to them. Other 6-in. curtain walls are also used to enclose the cantilever side spans, giving them the appearance of heavy abutments. These curtain walls are supported on cantilevers extending from the transverse beams. The pilasters are cantilevered from the columns.

Curved retaining walls in line with the legs of the frame are also a novel feature of the design. Their stability is much greater than that of the ordinary type of reinforced concrete retaining wall since the foundation pressure is almost uniformly distributed over the footing area. Greatly reduced earth pressure combined with the vertical load on the top slab and the rear cantilever extending from the vertical rib make it possible to lead the resultant force in the rib to the center of the footing. The foundation pressures are reduced accordingly, and the result is a width of footing much smaller than would be possible with the standard type of retaining wall. The platform spanning between the legs of the frame was made necessary on account of the retaining wall employed. Without this platform the retaining wall would have been subjected to full earth pressure at its juncture with the 12-in curtain walls between the legs.

The 8-in. thick deck slab is reinforced in both directions with ½-in. square bars spaced 6-in. on centers. The spacing of the transverse beams is 12 ft. and 9 ft. 10 in. in the main span and the cantilevers respectively. Reinforcing steel is of intermediate grade. All main bars exceeding 80 ft. in length were electrically arc-welded, with joints in the reinforcing bars placed at points of minimum stress.

The sequence of operation in placing the concrete was as follows: footings, columns to bottom of girder haunches, deck. The deck was poured in two sections, with a construction joint near the center of the span. The maximum dead load deflection in the center of the span was ⅝ in.

Bridge and road are a U. S. public works project. The bridge was constructed during 1936 and was opened for traffic in February, 1937. It was designed in the office of Louis S. Cain, territorial highway engineer, by the writer, who also supervised the construction. Robert W. Belt was resident engineer. Jack Moskowitz, principal highway engineer, was the representative of the U. S. Bureau of Public Roads. The bridge was built by the Kalihi Contracting Co.

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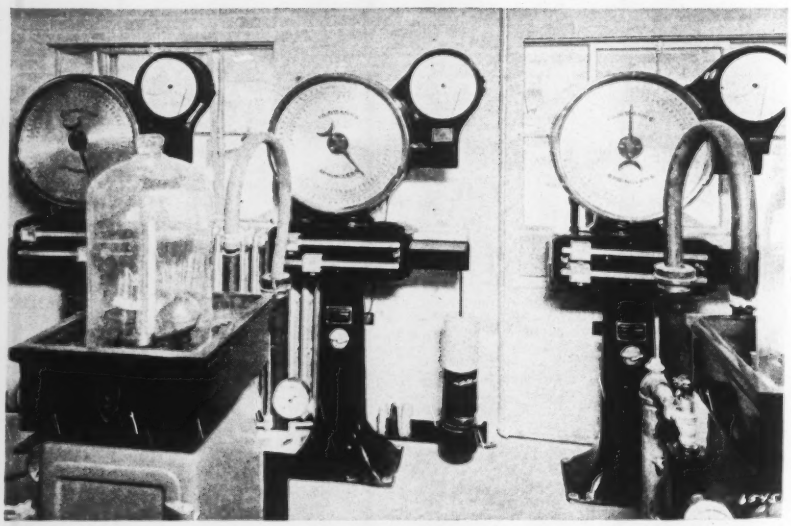
Dial Scales Record Chemicals Used

DIAL SCALES installed in the Denver West Side filtration plant to check the weights of materials used in water purification, are equipped with pen recorders which provide a continuous record of the materials used. According to an article in the Fairbanks-Morse *News*, three scales are used for weighing chlorine and a fourth is used for ammonia or ammonium sulphate.

Dial charts are graduated to 100 lb. by ½ lb. increments. So that it will be possible to tell at a glance both how much material has been used and how much remains in the containers, the charts are graduated both clockwise and counter-clockwise. Each scale has two tare beads graduated to 50 lb. by ½ lb. increments, and an extended bead with counterpoise weights for balancing the net and tare weight of the container.

The dials and recorders are located on the second floor, but the scale platforms are on the ground floor, where the chlorine and ammonia containers can be placed upon them when delivery is made.



Dial scales and recorders for weighing chlorine in Denver's new West Side plant.

BOOK NOTES AND REVIEWS

The month's additions to the engineer's reading and reference list

Planning in 1937

AMERICAN PLANNING AND CIVIC ANNUAL—Edited by Harlean Janes. 404 pp. Published by the American Planning and Civic Association. Washington. Price $3; $2 to members of the association.

Bringing together what the editors of the American Planning and Civic Association consider to be the best thinking of the year on planning, the 1937 manual is a compendium of recent events and current trends in this presently active field. All phases of planning are discussed in the book, which deals in turn with national, regional, state, metropolitan and county, and city interests. The 79 papers presented were selected from important conferences held during the year, and thus represent an authoritative appraisal of planning progress.

Sewer Construction

SEWERS—Theory, Design, Specification and Construction—By E. B. Bevan and B. T. Rees. 334 pp. Published by Chapman & Hall, Covent Gardens, London. Obtainable through Engineers Book Shop, 168 E. 46 St., New York, Price $10.

This new text on sewerage by two British engineers identified with important drainage projects abroad ranks high as a practical treatise on sewer design and construction. One of the features of the text is the step-by-step sample calculations and outline of methods employed in the design of typical drainage works. In addition to specific examples dealing with the more common problems met and solved in sanitary sewer schemes, special attention is given to the design of inverted siphons, pumping stations and sewer outfalls. In connection with the latter there are described the manner of making and correlating tide and float observations with outlet locations and storage tank discharges.

Construction methods, typical details, timbering operations in bad ground, ventilating measures, etc., are adequately dealt with. This alone with chapters on materials specifications, contract requirements and engineering administrative methods occupy about half the contents of the book. Since there is much in common between American and British practices, this new text will be found to contain considerable information useful to engineers in this country.

Flood Plan Criticized

OLD MAN RIVER SPEAKS—By L. T. Berthe. 35 p.p. Limited Edition. Address the Author, Charleston, Missouri.

"Old Man River Speaks" presents engineering discussion couched in semidramatic form. The arrangement looks like an attempt at humorous effect, but the reader should be warned in advance that the book is not humorous.

With rare courage the author of this playlet steps on the stage as one of his own characters. He is Private Berthe; his fellow-players are interlocutors (the people who live in the Mississippi Valley), the generals (the army engineers) and Old Man River (the Mississippi). Their subject of discussion is the test to which the official flood-control plan was subjected by last January's flood, or, more specifically, the near destruction of Cairo by the flood.

In tabulated dialogue—another bold innovation in dramatic composition—the book sets forth that the official plan for Mississippi flood control promised that Cairo, whose levee tops are at sixty foot stage, would be protected against a flood that would reach a gage height of sixty-six feet if unrelieved by overflow or bypass discharge. The unrelieved height of the 1937 flood is placed by the author at sixty-three feet or less. Yet the city escaped destruction only by dint of a desperate battle. Why the alarming difference between promise and performance? This is the essential point of the book.

Those who recall the post-flood events of 1927 and 1928 will recognize that the matter at issue is the efficacy of the Birds Point floodway. This is the expedient that was worked out by Gen. Edgar Jadwin as the final element of a three hundred million dollar project for control of the Mississippi. Mr. Berthe declares that despite approval by the Jadwin-Jackson-Sturtevant review board, the floodway did not accomplish the intended stage reduction and would not protect Cairo against the design flood.

This single reference to the history of ten years ago may suffice to make clear that in its very nature the book is sharply, even bitterly, critical. The author draws on a wealth of data, and his long acquaintance with the river should assure good judgment in applying them. But he does more than merely criticise: He proposes definite protective steps, for study. They include levee raising and partial filling of the Cairo area, among other things.

Old Man River's problem is likely to be with us for a long time to come, all concerned ought to have the Berthe book; it is instructive as well as interesting.

Property Valuation

VALUATION OF PROPERTY — Two volumes. By James C. Bonbright. 1,271 pp. Published for the Columbia University Council for Research in Social Sciences by McGraw-Hill Book Co., New York and London. Price $12.

THE SCIENCE OF VALUATION AND DEPRECIATION—By Edwin B. Kurtz. 221 pp. Published by The Ronald Press Co., New York. Price $4.50.

ENGINEERING VALUATION—By Anson Marston and Thomas R. Agg. 655 pp. Published by McGraw-Hill Book Co., New York and London. Price $6.

Two works on valuation were published late in 1937, Bonbright's two-volume work "Valuation of Property," and Kurtz' much smaller book "The Science of Valuation and Depreciation." With them for the purposes of this review is grouped Marston's and Agg's "Engineering Valuation," of earlier publication date, as it has not been noted in these pages.

The Bonbright work is a very comprehensive review of the many aspects of property valuation. It is in fact the summarization of a long series of writings on valuation and related questions by the staff of the law school of Columbia University. Thus the two volumes represent the views of many writers.

All phases of valuation are covered

in the Bonbright books; value as a measure of damages or fire loss for insurance purposes, valuation in the exercise of eminent domain, valuation for tax purposes, and determining value for rate-making purposes. All methods are discussed as are such theories as "prudent investment" and the "reproduction new." Many of the subjects discussed are probably of more interest to lawyers than engineers, such as those relating to corporate reorganizations, but engineers who find the general subject of interest will find the two volumes absorbing.

Marston's and Agg's book is more directly a working tool for engineers, as the title indicates. Nearly half the book is given over to depreciation and related subjects, to wage and price trends and construction-cost indexes, and to summaries of many important court decisions. Concise outlines of methods of valuation take up a third, and the remainder is taken up by interest and other tables, including valuable ones giving service life of buildings and equipment.

Though this book appears as a "first edition" there have been five previous editions in mimeographed form and the present work is the result of experience in using those earlier editions.

Still more concise is the Kurtz book. It covers the practical application of the abstract theories set forth in the author's earlier work "Life Expectancy of Physical Property." Tables and diagrams are freely used, there being 65 life characteristic charts for pumps, electrical and railroad equipment and farm implements.

The three books give engineers a wide range of choice in selecting text books relating to valuation and depreciation.

Water Lost Through Trees

WATER UTILIZATION BY TREES, with Special Reference to the Economic Forest Species of the North Temperate Zone—By Olan Raber. Misc. Pub. No. 257, U. S. Department of Agriculture. 97 pp. Obtainable from the Superintendent of Documents, Washington, D. C. Price 15 c.

Water utilization by trees plays a vital part in the conservation of water resources. This factor cannot be ignored either in flood control or in water supply studies. It is of utmost importances in run-off studies to know whether the vegetative cover consumes water or conserves it for stream-flow equalization. This publication of the Department of Agriculture is welcome as a valuable inventory of existing information concerning the utilization of water by trees. Included is a record of the absorption of water by trees, which ranges from 6 to 20 in. of rainfall depending on the species.—*Reviewed by* C. A. BETTS, *Assistant Regional Forester, U. S. Forest Service, Washington, D. C.*

MISCELLANEOUS NOTES ON BOOKLETS AND REPRINTS

LAND UTILIZATION STUDIES in Massachusetts are discussed in the "Planning Forum," Vol. 1, No. 8, published by the State Planning Board, State House, Boston.

SAFE WELL CONSTRUCTION is the subject of a pamphlet entitled, "Wells, Dug, Drilled, and Driven" published as Educational Health Circular No. 14, Illinois Department of Public Health, Springfield, Ill.

MASONRY WALL RESISTANCE to Rain Penetration is the subject of a mimeographed report by the National Bureau of Standards, Washington, D. C. It is known as Technical Information on Building Materials No. 58.

THE SECOND REPORT of the U. S. Geological Survey on underground waters was published late in 1937 as Water Supply Paper 817 entitled "Water Levels and Artesian Pressure in Observation Wells in the United States in 1936." Copies may be obtained from the Superintendent of Documents, Washington, D. C. Price, 75 cents.

CONCRETE PIPE FOR DRAINAGE STRUCTURES for Highways and Railroads is the title of a booklet by M. W. Loving, secretary of the American Concrete Pipe Association, Chicago. Practical design and construction methods, obtained from prominent engineers are illustrated by numerous pictures and clear-cut drawings. Run-off diagrams, charts and tables, A.S.T.M. culvert and sewer pipe specifications, bedding, backfilling and jointing practice are included.

NEW PUBLICATIONS

HANDBOOK OF THE PORT OF WELLINGTON, NEW ZEALAND—Prepared and published by the Wellington Harbour Board. 80 pp. Obtainable from the board, Wellington, N. Z.

INVESTIGATION OF ROAD PROBLEMS IN THE U.S.A. AND CANADA IN 1937—Report to County Roads Commission of Victoria, Australia, by W. T. B. McCormack. 249 pp. Published by the County Roads Board, Melbourne, Australia.

AIR CONDITIONING IN SUMMER AND WINTER — By Richard E. Holmes. 296 pp. Published by McGraw-Hill Book Co., New York & London. Price $3.

HYDRO- AND AERODYNAMICS—By S. L. Green. 163 pp. Published by Sir Isaac Pitman & Sons, London, and Pitman Publishing Corp., New York. Price $3.50.

HOW TO HANDLE GRIEVANCES—By Glenn Gardiner. 52 pp. Published by Elliott Service Co., 219 E. 44th St., New York. Price $0.60.

STATICALLY INDETERMINATE FRAMEWORKS—By Thomas F. Hickerson. 205 pp. Published by the University of North Carolina Press, Chapel Hill, N. C. Price $3.

REGIONAL PLANNING PART V—Red River of the North—Prepared by the Interstate Committee on the Red River of the North, St. Paul., Minn. 80 pp. For sale by the Superintendent of Documents, Washington, D. C. Price $0.25 (paper cover).

ILLINOIS STATE WATER SURVEY—Bulletin No. 31. Preliminary Data on Surface Water Resources. Prepared by State Water Survey Division, Urbana, Ill.

GOVERNMENT HYDRO vs. PRIVATE STEAM POWER—A Study in Relative Economy. Prepared by the Power Authority of the State of New York. 115 pp. For sale by the Superintendent of Documents at Washington, D. C. Price $0.10.

WOOD PRESERVATION—By George M. Hunt and George A. Garratt. 457 pp. Published by McGraw-Hill Book Co., New York and London. Price $5.

ENGINEERING LAW—By R. E. Laidlaw and C. R. Young. 380 pp. Published by the University of Toronto Press, Toronto, Ont. Price $4.

STEEL CONSTRUCTION—Third Edition. 398 pp. Prepared and published by the American Institute of Steel Construction, New York. Price, $2.

THE WEEK'S EVENTS

(Continued from page 131)

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

NATIONAL SAND AND GRAVEL ASSOCIATION, annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, Jan. 31-Feb. 3.

ENGINEERING INSTITUTE OF CANADA, annual meeting, London, Ont., Jan. 31-Feb. 1.

LIME PUTTY PRODUCTS ASSOCIATION, annual meeting, Netherland Plaza Hotel, Cincinnati, Feb. 1.

AMERICAN CONCRETE CONTRACTORS ASSOCIATION, National Concrete Masonry Association, National Cinder Concrete Products Association, Cast Stone Institute, joint convention, Hotel Sherman and Medinah Athletic Club, Chicago, Feb. 7-11.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, annual convention, Willard Hotel, Washington, Feb. 8-10.

CONSTRUCTION LEAGUE OF THE UNITED STATES, annual meeting, Willard Hotel, Washington, Feb. 11.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Engineering Societies Building, New York City, Feb. 14-18.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, annual convention, Hotel Ambassador, Atlantic City, N. J., Feb. 16–18.

AMERICAN TOLL BRIDGE ASSOCIATION, annual convention, Hotel Chamberlin, Old Point Comfort, Va., Feb. 22-24.

REGIONAL AND LOCAL

NORTH CAROLINA SOCIETY OF ENGINEERS, annual meeting, Raleigh, Jan. 28-29.

ASSOCIATION OF ONTARIO LAND SURVEYORS, annual convention, Royal York Hotel, Toronto, Ont., Feb. 15-16.

SOUTHWEST ROAD SHOW AND SCHOOL, annual session, Wichita Exhibition Building, Wichita, Kan., Feb. 22-25.

ARKANSAS ENGINEERS CLUB, annual meeting, Hotel Marion, Little Rock, Feb. 25-26.

IOWA ENGINEERING SOCIETY, annual meeting, Iowa City, Mar. 9-10.

NEW JERSEY SEWAGE WORKS ASSOCIATION, annual meeting, Stacy Trent Hotel, Trenton, N. J., Mar. 10-11.

SECTION MEETINGS, American Water Works Association:
New York, Jamestown, Mar. 17-18.
Canadian, Windsor, Ont., Mar. 23-25.
Indiana, West Lafayette, April 7-8.
Pacific Northwest, Spokane, May 19-21.

ELECTIONS AND ACTIVITIES

J. S. WILLIAMSON, chief highway engineer of South Carolina, was elected president of the South Carolina Society of Engineers at a meeting at Columbia early this month. Other officers elected were: Sam R. Rhodes, vice president; A. E. Johnson, secretary-treasurer; F. W. Chapman, L. C. Boone, F. B. McDowell, directors. Speakers included A. B. McMullen, chief of the airport division of the Bureau of Air Commerce; Dr. J. Rion McKissick, president of the University of South Carolina. Lt. Col. John Anderson, professor of engineering at The Citadel; and Commdr. K. B. Bragg of the U. S. Navy.

A WASHINGTON STATE CHAPTER of the National Society of Professional Engineers has been organized with headquarters in Seattle. Joseph E. Wickstrom is temporary president of the chapter, James W. Carey and W. C. Bickford vice-presidents, and Karl F. Vaughn executive secretary and treasurer. The organization has enrolled 254 members from among about 1800 who are eligible in the state. Autonomous chapters of the state society are to be organized in every county.

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Short Course

Rutgers University College of Engineering, short course in "Sewage Disposal and Plant Operation," sponsored by the New Jersey Sewage Works Association, Feb. 14-26.

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License Examinations

NEW YORK: Examinations for professional engineers at New York, Albany, Syracuse and Buffalo, Feb. 1-3. Examinations for land surveying will be held on Feb. 4.

BRIEF NEWS

CONTRACT for construction of the $500,000 dam on the Richilieu River at Friar's Island has been awarded by the Canadian federal government to the E. G. M. Cape Co., Ltd., of Montreal, the low bidders. The dam will control floods in the Lake Champlain area and aid navigation on the Richilieu River. A proposal to use the river as part of a deep water connection between Montreal and New York City was recently rejected by the International Joint Commission (*ENR*, Jan. 13, 1938, p. 45).

INTEREST on bonds issued by a town to finance public works in New York State is not to be figured as part of the total cost of the improvement under New York law, the state Supreme Court ruled recently. Voters of the town of Woodstock authorized construction of a town hall at a cost "not to exceed $32,000." A taxpayers' injunction against completion of the building was sought on the ground that, if interest on bonds were included, the cost of the building would exceed the limit set. The court denied the injunction.

EVEN THOUGH the federal government pays part of the cost of municipal improvements, the city auditor of cities in Ohio must certify the total amount of the contract. The auditor may, however, certify the amount of the government's share as revenue "in process of collection." The Common Pleas Court of Cincinnati so held, recently, in a taxpayers' suit seeking to enjoin payment on a $214,600 paving contract held by the W. L. Johnston Construction Co.

FLOOD DAMAGE to Louisville, Ky., sewers amounts to only $856,000, final check-up revealed. Of 28.1 miles of sewer inspected, 6,500 ft. needs reconstruction and 5,545 ft. needs major repairs.

DETROIT water rates will have to be increased 18 per cent to avoid a $1,143,000 deficit, the water board has estimated. About $725,000 is included in the water budget for capital expenditures, and maintenance estimates have been increased $300,000 to $6,700,000.

A HIGHWAY CONSTRUCTION program for 1938 amounting to $12,645,000 has been recommended to the New Jersey legislature by the state highway department. Carrying out of the recommendations will depend on whether or not the legislature diverts highway funds to relief purposes.

PERSONAL

HENRY L. ROWLAND, formerly assistant city engineer of Bridgeport, Conn., has been appointed city engineer. Mr. Rowland, a graduate of Sheffield Scientific School, has been connected with the city's engineering department for 25 years. Earlier he was associated with the N. Y., N. H. & H. R. R. and with the U. S. Government as a War Department inspector. He became assistant city engineer immediately after the war.

LESLIE G. HOLLERAN has resigned his position as chief engineer of the Federal Emergency Administration of Public Works for New York State and has been named consulting engineer for the New York City WPA. Before his federal connection, which he assumed in 1933, Mr. Holleran was for a number of years deputy chief engineer of the Westchester County, N. Y., Park Commission.

HARRY W. EUSTANCE, for eleven years city engineer of Ithaca, N. Y., and more recently engaged in the construction of cement stabilized earth roads as demonstration projects for the Portland Cement Association, has joined the engineering staff of the Eastman Kodak Co. in the department of engineering and maintenance at Rochester, N. Y.

E. H. WEILEMAN, for the past two years project design engineer on the Chickamauga project of the TVA, has been appointed project design engineer for the Gilbertsville project.

H. W. ALEXANDER, for eight years resident engineer and secretary of the city planning and zoning commission and later secretary of the housing commission at Louisville, Ky., has been made regional supervisor for the U. S. Housing Authority, covering the states of Ohio, Pennsylvania, Maryland, Delaware, Virginia, West Virginia, and Kentucky. He is on a leave of absence from his city position. Before entering the city employ, Mr. Alexander was connected with the St. Louis city planning firm of Harland Bartholomew & Associates.

JAMES DUNSTAN has been appointed city engineer of Wenatchee, Wash. He was formerly assistant engineer of Chelan County.

A. GILBERT DARWIN has resigned his position as county engineer of Garfield County, Wash.

CAPT. S. L. DAMON, district engineer since last June in the Portland district of the U. S. Engineers, has been promoted to the rank of major.

ROBERT L. J. WAGAR, chief engineer for WPA at Marion, Ohio, has resigned that position to become city manager of Sandusky, Ohio. He was city engineer there in 1933 and 1934.

S. S. STEINBERG, head of the department of civil engineering at the University of Maryland, has been named dean of the college of engineering, succeeding Dr. Johnson. Prof. Steinberg has been serving as acting dean.

JAMES E. GIBBONS, consulting engineer and until recently director of labor relations for the General Contractors' Association of New York, has joined the American Surety Co. of New York and the New York Casualty Co. to assist in underwriting and settlement of claims on contract bonds. Mr. Gibbons has been active for many years in tunnel, subway and foundation work.

DON A. MCCREA, M. Z. Bair and K. W. Lefever have become associated to practice engineering with offices in Little Rock, Ark. They will specialize in water, sewer and highway work. Mr. Bair has been state sanitary engineer of Arkansas since 1919.

A. A. MATHEWS, for the past three years supervising engineer of the Moffat water tunnel project, has resigned to become sales representative for J. M. Moore Railway Industrial Supplies Co. of Denver.

J. A. ELLIOTT, district engineer for the U. S. Bureau of Public Roads at Denver, has been transferred to the Southwest District, as district engineer, with headquarters at Fort Worth, Texas.

B. W. MATTESON has been made district engineer for the Bureau of Public Roads at Denver. He was formerly senior highway engineer in the Bureau's regional office at San Francisco.

JOSEPH S. PECKER, mechanical engineer, who has been devoting the major part of his time for the past four years to the development of the American Centrifugal machine for sewage and industrial sludge dewatering, has terminated his contract with the American Centrifugal Corp. and will continue as designer and consultant on equipment for the sanitary disposal field.

PAUL W. BAKER, recently connected with the U. S. Department of Agriculture, has joined the Wellwood Engineering Co. of Omaha and will be engaged on construction work on the Platte Valley, Loup, and Central Nebraska hydro-electric projects. Mr. Baker was previously in charge of headworks construction on the Loup project and later was an engineer for the Metropolitan Utilities District in Omaha.

W. L. STEVENSON, formerly chief engineer of the Pennsylvania Department of Health, has become associated with the firm of Metcalf & Eddy. He will have offices in Harrisburg.

OBITUARY

JOHN L. BECTON, consulting engineer of Wilmington, N. C., died Jan. 8 at the age of 52. After his graduation in 1908 from the North Carolina College of Agriculture and Mechanical Arts, Mr. Becton served for three years as deputy city engineer of Wilmington, N. C., and then entered private practice in Wilmington. He was a past president of the North Carolina Society of Engineers.

EDWIN M. CAPPS, former harbor engineer and city engineer of San Diego, died in Los Angeles, Jan. 16, at the age of 77. Mr. Capps entered engineering work in 1880, surveying mining claims in Colorado and later doing survey work in San Diego. In 1888 he became chief engineer of the Lower California Mining Co. and was later chief engineer on water and irrigation projects. In 1893 he became city engineer of San Diego and mayor there seven years later. He left the city service to become chief engineer of the Tejunga Land & Water Co. and then practiced privately for some years in Los Angeles and Seattle. In 1909 he returned to San Diego as city engineer and in 1912 became harbor engineer there. He served again as mayor of the city from 1915 to 1917.

FRANCIS R. HART, president since 1933 of the United Fruit Co. and active at the turn of the century in railway work in South and Central America, died Jan. 18 in Boston at the age of 70. Mr. Hart, a graduate of Massachusetts Institute of Technology, served with the Cartagena-Magdalena Ry. from 1889 to 1906, rising from the position of general manager to that of president. He served for eight years in the consular service in Columbia. Through his railway affairs, Mr. Hart became interested in financial matters and served on the board of directors of several Boston banks as well as a number of railroad and steamship companies.

BRUNO THOMAS, retired civil engineer of Seattle, died there Jan. 10 at the age of 78.